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PLOT SAMPLES OF WATERSHED HYDROLOGY

JUNE 1967 ARS 41-133

Agricultural Research Service

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PLOT SAMPLES OF WATERSHED HYDROLOGY

H. N. Holtan and N. E. Minshall[1]

INTRODUCTION

The original purpose of this study, conducted during the early 1940's, was to learn if a relationship exists between the hydrograph of a watershed and the hydrographs obtained from small sample plots within the watershed for any specific storm. The data from this study have provided a basis for numerous analyses[2] useful in the development of concepts for watershed hydrology. However, the application of runoff data obtained from small plots to large areas is still a highly debatable subject.

The hydrologic measurements presented in this report were gathered on small plots within two watersheds near Edwardsville, Ill., from 1940 to 1943. These measurements and analyses provide the most comprehensive data currently available (1) on the infiltration rate of water as it is affected by soil moisture, soil temperature, soil structure, and vegetative cover, (2) on the seasonal variation of infiltration, and (3) on the rainfall and infiltration data needed to predict surface runoff.

The almost complete listing of data in the appendix is intended both as an aid to the development and teaching of hydrologic concepts for watershed engineering and for the benefit of those who may desire to perform further analyses. Analyses included here are selected from inservice technical publications directly pertinent to this objective. Many additional analyses are possible and desirable.

Under provisions of the Water Resources Act of 1964, Water Resources Institutes have been established at each of the land-grant universities and in Puerto Rico. Many of these Institutes conduct research in hydrology. In courses associated with these research programs, both professors and students of hydrology at the Institutes are seeking actual measurements of hydrology events--such as reported here--for classroom study and project assignments.

Since most watersheds have heterogeneous vegetation, soils, topography, geology, and land management practices, the use of small plots may facilitate the isolation of these factors in their influence upon the hydrologic performance of the watershed. Two watersheds near Edwardsville, Ill., (fig. 1) were surveyed with an infiltrometer and subdivided according to infiltration capacity. The subareas were then studied simultaneously with the encompassing watershed for hydrologic performance in response to natural rainfall. Watersheds I and II were chosen for this experiment because of their diverse soils and land-use history; also, these two watersheds had previously been equipped with rain gages and triangular weirs[3] for the continuous measurement of rainfall and streamflow at the watershed outlet.

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[1] Director, Hydrograph Laboratory, Beltsville, Md., and hydraulic engineer, Madison, Wis., respectively, Soil and Water Conservation Research Division, Agricultural Research Service, U.S. Department of Agriculture.

[2] Chow, Ven Te, editor, Handbook of Applied Hydrology, Section 12. McGraw-Hill Book Co. 1964.

[3] Holtan, H. N., Minshall, N. E., and Harrold, L. L. Field Manual for Research in Agricultural Hydrology. U.S. Dept. Agr. Handb. 224. 1962.

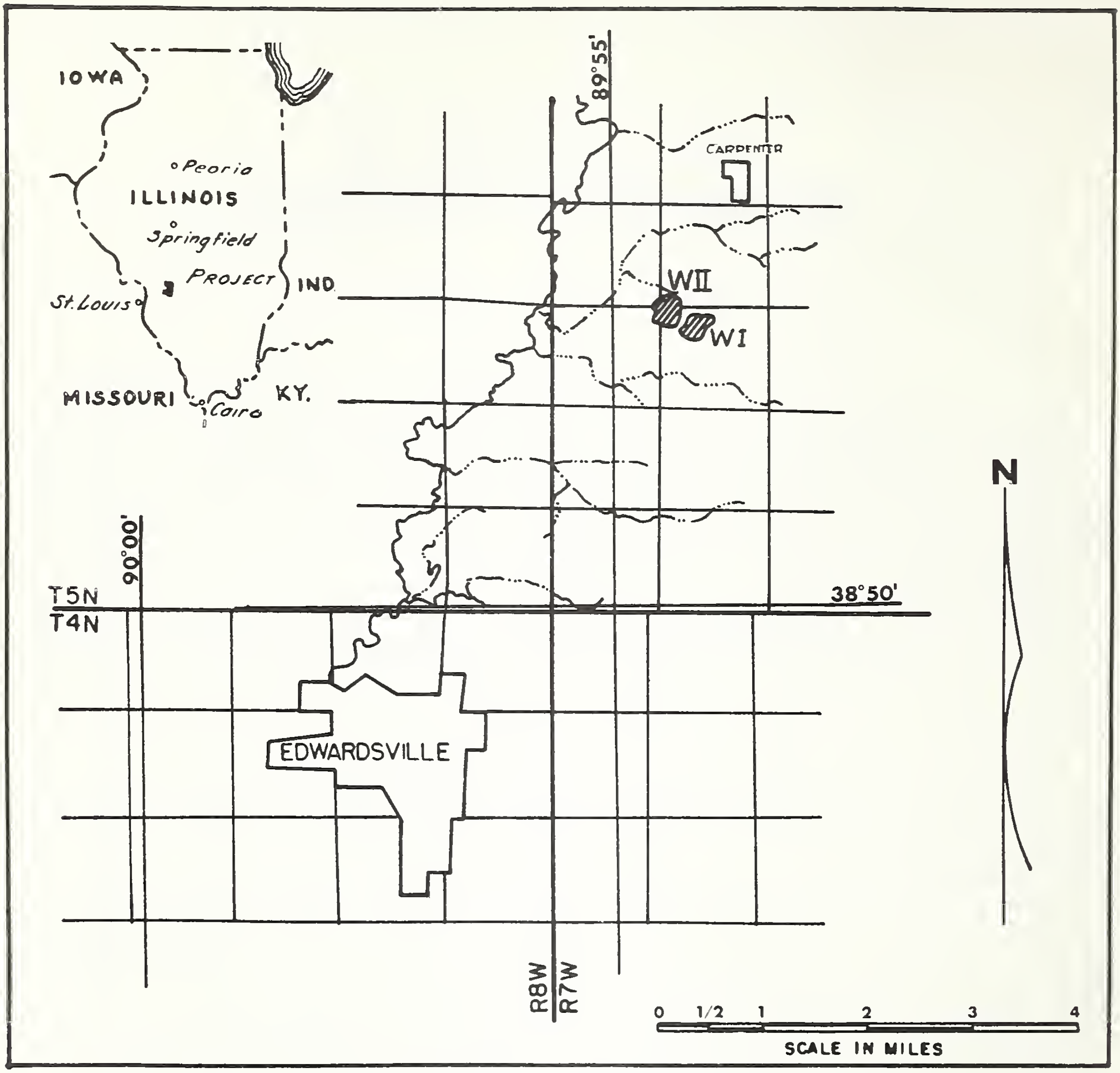

Figure 1.--Location of watersheds I and II, Love farm, Edwardsville, Ill.

GENERAL PROCEDURE

In part I of this study, infiltration surveys were made of watersheds I and II for the preparation of isopotal maps (areas of equal infiltration capacity). The type "F" infiltrometer, a rainfall simulator, was used in the survey. The assumption was that even though infiltrometer results may not agree precisely with natural rainfall results, the data would be relative and could be used to delineate isopotal areas.

Conditions on the two watersheds were classified according to combination of vegetation, soil type, and slope. Rectangular plots 6 by 12 feet were installed in duplicate to represent each condition for repeated infiltrometer runs. This was done to insure that recurrent runs would represent most of the conditions on the two watersheds. Eight plots were required, three in watershed I and five in watershed II. (See fig. 2 for locations of plots 1 to 16.)

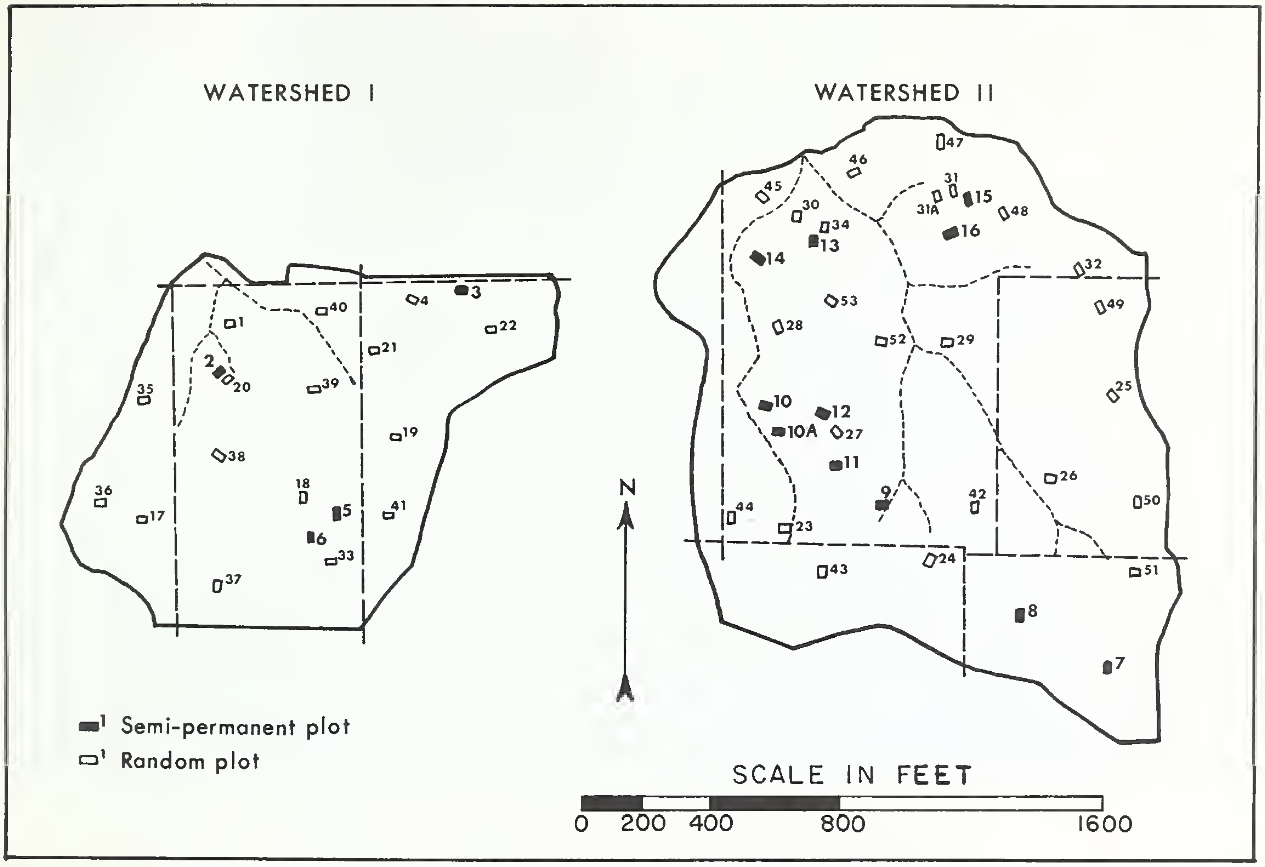

Figure 2.--Locations of infiltrometer plots on watersheds I and II.

Plots, with the exception of plots 3 and 4, were tested with the infiltrometer at intervals of approximately 5 weeks, beginning in May 1940. The 14 installed plots were tested in pairs to provide duplicates during three different rounds for evaluation of effects of season, antecedent soil moisture, soils, and land use. More detailed examination of soil profiles after the first round of testing resulted in rejection of plot 10A as nonrepresentative of Alma silt loam. Plot 10 of table 11 was substituted for 10A. In August of 1940 plots 3 and 4 were installed to represent newly seeded alfalfa in watershed I. Twice during the growing season an equal number (16) of random sites were tested on dates intermingled alternately with the dates of recurrent test runs on the 16 installed (semipermanent) plots (fig. 2). During these periods the original 16 installed plots were not tested in pairs, but rather two rounds of the problem areas were made, testing one only of each pair staggered with a random site; thus the 5-week interval between visits to each problem area was maintained. It was intended that these random sites should bring to light any significant area which was not originally recognized.

During the winter no random plots were tested, since the soil profiles were saturated and suitable temperatures occurred at rare intervals. Only one of each pair of the semipermanent plots was tested during each round to minimize the time interval between test runs on the various installed plots. Results of all runs are presented in the appendix, together with records of such variables as temperature, antecedent soil moisture, volume weight of soil, soil type, and vegetative cover.

It was hoped that an isopotal map could be prepared directly from values derived by the infiltrometer, but the rate of infiltration was so greatly influenced by changes in soils and vegetation near waterways that the infiltrometer sites did not afford sufficient detail to draw isopotal lines. Infiltrometer values correlated with vegetative density, soil depth, soil moisture, and land slope. The watersheds were therefore surveyed for vegetative density, depth of topsoil, and degree of slope. These physical characteristics were used to estimate infiltration by an equation of multiple regression derived through statistical analysis. The estimated infiltration capacities were plotted on maps of the watersheds. Final isopotal maps were then prepared from infiltrometer values, after adjusting to a standard antecedent soil moisture and temperature in addition to values estimated through the regression equation applied to physical measurements of vegetative density, depth of topsoil, and degree of slope.

In part II of the study, plots were installed to sample the hydrologic performance of each watershed. Infiltration capacities estimated from the survey of part I permitted a subdivision of watershed I into four isopotal areas, whereas watershed II, having a greater diversity, was divided into five isopotal areas. One plot (also 6 by 12 feet rectangular) was installed in each of the nine isopotal areas and equipped for continuous measurement of rainfall and runoff. Each plot thus represented a fraction of the watershed area as determined by the infiltrometer survey. Hydrologic records were then collected from plots and watersheds for the next 24 months.

PART I--INFILTROMETER SURVEY

The objectives of the infiltrometer survey were: (1) to survey watersheds I and II for the delineation of isopotal areas to be sampled by small plots for hydrologic performance in response to rainfall, (2) to identify the relationship between infiltration and site variables such as vegetative cover density, depth of topsoil, soil moisture, soil temperature, and land slope, (3) to determine the range and occurrence of seasonal variation in infiltration, and (4) to test possibilities of predicting surface runoff when rainfall and infiltration are known.

Apparatus--The Type "F" Infiltrometer

The type "F" infiltrometer consisted of 14 specially designed type "F" nozzles arranged in two lines of 7 nozzles each. The lines were placed one on each side of the plot, mounted upon adjustable legs, and spaced by spreader rods outside each end of the 6- by 12-foot plot. The nozzle lines were set horizontal rather than parallel to the plot slope to avoid variations in rainfall distribution due to differences in land slope. The best sprinkler distribution was obtained with the nozzles set at about 7 degrees off of the vertical, leaning toward the plot center. Action arms, with adjustment screws, were welded on to each nozzle line. This permitted adjustment to the proper nozzle tilt.

The nozzle lines were placed equidistant from the plot's length axis centerline, with the center nozzle of each gang directly over the width axis centerline of the plot. The lines were set level, with the supply line pipe 2 feet above the ground at the center nozzle.

Caps were arranged to instantaneously cover or uncover half of the nozzles or all of the nozzles in each line (fig. 3). This provided a high intensity of about 3.60 inches per hour or a low intensity of about 1.80 inches per hour. If the entire run was to be of low intensity, four alternate nozzles were removed from one line and the three alternate nozzles from the other line. To maintain good distribution, the nozzles covered or removed from one line could not be directly opposite those covered or removed from the other.

A galvanized sheet-iron pan, 6 by 12 feet, was placed on the plot to insure 100-percent runoff in calibrating the sprinkler intensity. A water meter in the supply line was read at regular intervals during both the calibration runs and the experimental runs to provide a continuous check on intensity.

Runoff was caught in pails and weighed to the closest 5 grams, a precision to the third decimal place in inches per hour.

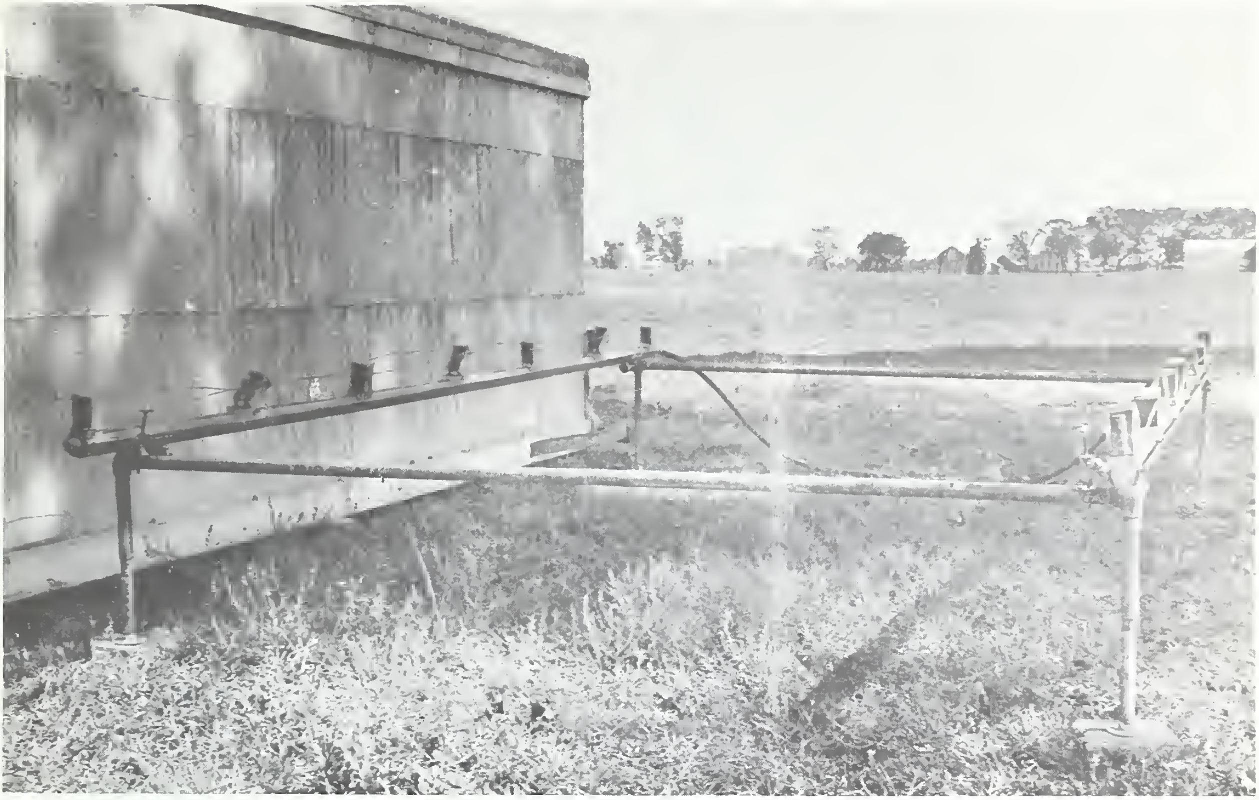

Figure 3.--Nozzle apparatus used to simulate rainfall on plot.

Procedure Used in the Survey

Operation of the Type "F" Infiltrometer

Operation of the type "F" infiltrometer usually consisted of two runs, initial and wet, on each plot. For very wet antecedent conditions only one run was made. After setting up the apparatus the pan was placed over the plot and the pump motor was started. A pressure of 35 pounds per square inch was maintained throughout the operation. After a few minutes needed to reach equilibrium, fifteen and twenty 1-minute samples of flow were taken to determine the average rainfall.

After the intensity had been determined, the pan was hoisted up and tied against the ceiling of the enclosure to avoid interception of raindrops. The caps were pulled over the nozzles, and the 35 pounds per square inch pressure was built up again. Then the caps were removed. All times were recorded in minutes from start of rainfall.

Time of first appearance of surface storage, time of first water movement on plot, and time of occurrence of runoff into the catchment tank or pail were all recorded. From then on all of the runoff was caught and weighed. The duration of samples was governed by the rate of change in flow. If the rate of runoff was changing rapidly, up or down, the samples were 1 minute in duration. As the runoff became constant, longer samples were taken; however, sample duration did not exceed 5 minutes. The initial run was continued until no appreciable increase in rate of runoff had occurred for 30 minutes. Then the caps were pulled over all nozzles at the same time that the runoff sample was removed. The runoff of the residual water immediately after rainfall stopped was measured in 1-minute samples again since the rate dropped rapidly.

Meter readings were taken at 4-minute intervals during the run and at 1-minute intervals during the calibration runs. These readings were taken at 15 seconds before the minute to avoid conflict with removal of samples. They were recorded as on the minute, however, to save a clutter of figures in the time column of the data sheet.

After residual runoff had stopped, the pan was replaced on the plot and another calibration run was made. If these samples agreed closely with the previous run samples, six or seven were sufficient. The average of the two calibration runs was used as the intensity during the run.

The day after the initial run a second run, called the wet run, was made on the same plot. Intensity calibrations preceded and followed this run as they did the initial run. The wet run consisted of two distinct sprinkler applications. The first application proceeded until the runoff had been constant for one-half hour; then the nozzles were covered. The plot was watched and at the time surface storage had practically disappeared, the second application was started and continued until runoff had been constant for at least 10 minutes; then it was cut off again.

Supplementary Data

(a) Temperatures of the wet soil, runoff, air, and water supply were taken during the run. These are given in table 6 of the appendix.

(b) Soil moisture samples were taken outside the plot border area in the surrounding field area before the initial run, and in the wetted border area before the wet run. Percent moisture was computed on the dry-weight basis. Determinations are included in table 6 of the appendix.

(c) Eight or ten unbroken clods of soil were taken in the field area from each of the top two horizons of the profile. These were wrapped in waxpaper and rushed to the laboratory for coating with paraffin. Volume weights were determined by immersing wax-coated clods in water and measuring the displacement.

(d) Soil profile descriptions were written up for each plot and are included in table 11 of the appendix.

Cover canopy conditions were described and evaluated with the aid of the frame and ten tines used in the Iowa Method of pasture density count. Ten tines were held in a vertical position by a frame as illustrated in figure 4. As each tine was manually pushed downward, a count was made of the tines hitting a leaf, stem, crown, or root. Ten settings were used on each plot, a total of a hundred counts.

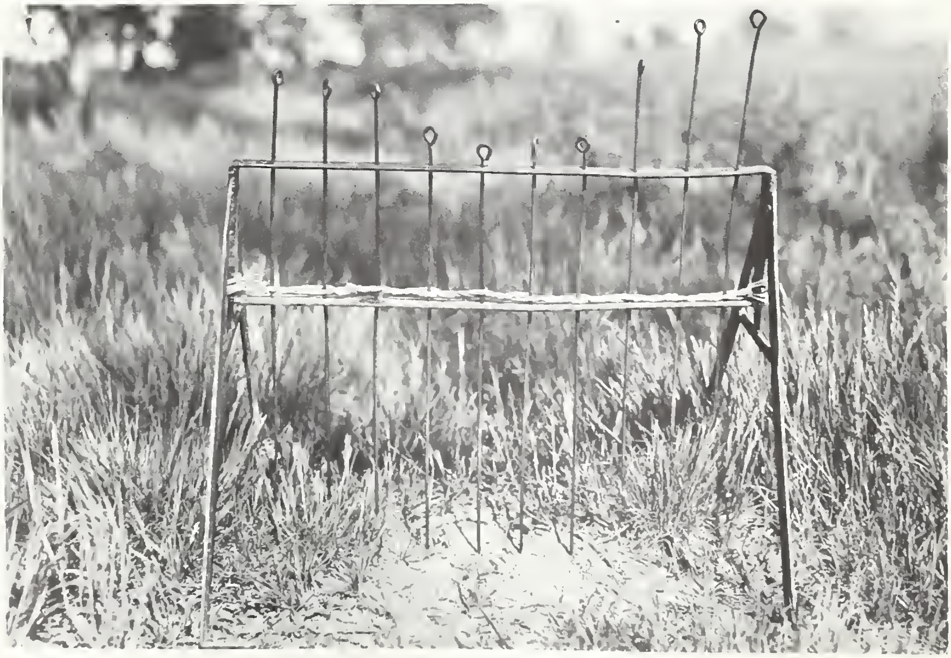

Figure 4.--Frame and ten tines used in Iowa Method of pasture density count.

Personal estimates were also made of the total basal area of plants at the ground surface in percent of total plot area. For all statistical analyses these basal area estimates are referred to as the density count. The reliability of these personal estimates was later checked by comparison with determinations of basal area derived from a modified application of the Iowa Method. Instead of counting any vegetation which a tine may meet while en route to the ground, only those plant crowns or roots hit at the ground surface were counted. These determinations agreed very favorably with the personal estimates of basal areas of plants. This type of vegetative count more logically reflects root perforation of the soil surface and is thus a more likely parameter of infiltration. Cover descriptions are included in the appendix.

Results of the Infiltrometer Survey

Hydrograph Analyses

Infiltrometer hydrographs were analyzed by the techniques of Sharp and Holtan[4] illustrated in appendix figure 25A and B (see pp. 77-78). In order that the data might be made available to other research workers, tabulations of values from the analyzed hydrographs are also included in appendix tables 6, 7, and 8. It is intended that these tabulations should be complete enough to enable the reader to reconstruct the analyzed hydrograph quite accurately. Supplementary data mentioned in the preceding section on procedure are included in appendix tables 9 through 11.

Statistical Analyses

One of the objectives was to identify the relationship between infiltration and site variables. Table 1 presents plot characteristics, antecedent conditions, and the total mass infiltration at 3 hours after the start of the initial run on each of 54 plots. The wide range in antecedent conditions suggests that these data should provide a good test for influences upon the infiltration capacity. The results of a multiple regression analysis are given in table 2.

The equation for estimating mass infiltration from measured values of the seven plot characteristics of table 1 is as follows:

$$F = 1.8686 + 0.00988X_1 + 0.04764X_2 - 0.041455X_3$$
$$-0.042214X_4 + 0.051874X_5 - 0.003906X_6 - 0.014748X_7$$

The correlation coefficients in table 2 are starred for significance: One star means significant to the 5-percent level and two stars mean significant to the 1-percent level.

The volume of infiltration at the end of the first 3 hours of capacity rate is significantly affected ($R = 0.7031^{**}$) by the combined action of all seven variables. The correlation coefficients of table 2, however, are not significant for antecedent soil moisture in the 14- to 21-inch layer or for soil temperature. Of the remaining five variables, depth of topsoil alone has almost as much effect on infiltration (r_{Y2} - 0.6307^{**}) as all seven factors combined ($R = 0.7031^{**}$). This same indication is strengthened by the significance of interactions of each of the other significant factors with depth of topsoil:

Cover and topsoil depth	0.4125**
Antecedent soil moisture:	
0 to 7 in. and topsoil depth	-.3747**
7 to 14 in. and topsoil depth	-.4399**
14 to 21 in. and topsoil depth	-.02517
Soil temperature at 2 in. and topsoil depth	.1998
Slope of plot and topsoil depth	-.6350**

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[4] Sharp, A. L., and Holtan, H. N. A Graphical Method of Analysis of Sprinkled-Plot Hydrographs. Trans. Amer. Geophys. Union, pp. 558 570. 1940.

TABLE 1.--Plot characteristics and mass infiltration (F) at 180 minutes from start of initial infiltrometer run[1]

Plot No.	Date of run	Cover density (X_1)	Depth of top soil (X_2)	Antecedent soil moisture in percent dry weight at--			Soil temp. at 2 in. (X_6)	Slope (X_7)	F at 180 min. (Y)
				0-7 in. (X_3)	7-14 in. (X_4)	14-21 in. (X_5)			
	1940	Pct.	In.	Pct.	Pct.	Pct.	°F.	Pct.	In./hr.
1	8/30	20	4	13.4	11.0	12.0	69	11.72	0.90
2	10/16	15	7	20.4	14.8	13.2	56	9.62	1.47
3	8/26	60	14	10.7	12.7	16.0	78	.83	2.38
4	10/21	80	14	17.0	15.0	19.8	58	1.30	3.62
5	10/29	30	15	16.5	15.4	20.0	63	1.22	2.24
6	9/13	30	14	13.5	15.6	21.0	65	1.00	2.04
7	9/18	75	18	10.2	13.8	18.8	72	1.36	2.04
8	11/7	75	17	8.5	9.5	19.4	48	1.30	1.85
9	9/23	95	12	6.8	13.1	20.1	71	8.27	2.78
10	11/29	100	8	27.4	22.5	22.7	44	8.30	1.84
11	9/30	95	16	7.6	12.6	16.5	61	1.25	4.30
12	11/20	95	20	17.8	15.0	18.7	49	1.67	3.35
13	10/7	70	10	24.3	21.8	21.6	60	15.25	2.63
14	12/9	75	8	21.3	22.2	20.4	51	16.83	1.70
15	12/20	5	2	24.7	26.0	24.8	41	12.11	.42
16	10/11	5	3	19.2	21.6	16.5	63	11.11	.69
17	10/18	20	15	11.5	7.8	14.9	55	1.20	1.29
18	9/16	60	14	6.7	8.6	17.1	68	.58	2.80
19	10/25	60	12	13.0	11.3	14.9	66	.47	4.43
20	9/12	25	7	7.4	8.4	12.9	61	7.60	1.38
21	10/23	50	6	15.0	14.5	17.4	63	2.70	2.74
22	8/28	90	15	18.8	12.4	14.6	76	.83	2.00
23	11/22	100	11	19.5	12.8	16.5	53	4.60	2.57
24	9/20	20	8	5.0	12.6	11.6	74	2.70	1.55
25	11/18	50	14	9.9	8.7	14.1	47	.25	2.23
26	9/27	5	3	9.4	15.4	15.5	64	8.40	.99
27	10/2	100	14	6.4	7.2	10.4	64	2.70	4.46
28	12/6	60	7	21.9	22.0	18.2	48	12.00	2.54
29	10/9	5	0	17.5	12.4	12.0	60	5.50	.80
30	12/12	85	7	22.9	18.6	13.9	40	8.70	1.25
31	12/23	5	3	25.2	25.4	27.4	40	12.40	.83
32	10/14	40	2	18.0	20.2	16.6	66	7.80	1.50
33	11/4	40	13	9.7	10.8	15.7	57	0	3.32
	1941								
34	3/25	80	9	28.8	26.6	27.0	42	12.20	2.38
35	5/27	25	6	13.4	19.9	19.1	72	2.90	1.60
36	5/28	35	14	12.0	13.9	22.6	75	1.30	3.21
37	6/17	10	14	18.0	18.1	23.4	67	1.00	2.21
38	6/16	15	10	19.0	18.1	22.5	67	1.90	2.94
39	6/9	5	7	6.3	8.5	16.1	73	.80	2.54

TABLE 1.--Continued

Plot No.	Date of run	Cover density (X_1)	Depth of top soil (X_2)	Antecedent soil moisture in percent dry weight at--			Soil temp. at 2 in. (X_6)	Slope (X_7)	F at 180 min. (Y)
				0-7 in. (X_3)	7-14 in. (X_4)	14-21 in. (X_5)			
	1941	Pct.	In.	Pct.	Pct.	Pct.	°F.	Pct.	In./hr.
40	6/6	15	11	14.0	20.0	20.7	69	5.20	1.85
41	5/29	25	16	8.0	14.3	24.6	70	.20	3.26
42	5/5	100	9	27.8	26.4	27.9	65	1.05	1.33
43	5/24	40	14	9.8	12.2	20.6	61	.20	4.09
44	5/8	95	11	25.3	24.5	21.0	60	.50	2.37
45	5/22	60	7	12.8	21.0	20.4	75	18.20	1.69
46	5/13	100	6	24.8	28.5	26.0	64	10.70	1.60
47	5/14	60	7	22.0	23.4	25.7	63	3.70	2.07
48	5/12	75	11	23.1	23.1	26.2	61	.75	1.61
49	5/15	85	13	20.7	21.9	26.1	71	.80	1.98
50	5/9	50	11	24.8	23.7	22.9	62	.95	1.42
51	5/16	65	9	19.3	21.4	24.5	70	2.70	1.75
52	5/21	95	9	20.2	24.4	26.9	74	3.00	3.04
53	5/20	90	10	22.3	21.5	25.5	68	1.60	1.96
31A	1/14	5	3	26.1	27.7	27.5	39	10.40	1.37

[1] Values taken from infiltrometer data, appendix tables 6 through 8.

[2] Definition of symbols:

[X_1, Cover density basal area of plants in percent plot area;
X_2, Depth of topsoil in inches;
X_3, Antecedent soil moisture in percent of soil dry weight at 0 to 7 inches;
X_4, Antecedent soil moisture in percent of soil dry weight at 7 to 14 inches;
X_5, Antecedent soil moisture in percent of soil dry weight at 14 to 21 inches;
X_6, Soil temperature at 2-inch depth in degrees Fahrenheit;
X_7, Percent slope of plot surface;
Y, Rate of mass infiltration at 180 minutes from start of run.]

For these watersheds, depth of topsoil is probably the best single criterion of mass infiltration. These watersheds have a fairly well developed B_2 horizon (clay loam) of the soil profile, which is relatively impervious to water. This layer may be responsible for the significant effects of depth of topsoil in that the storage capacity of the profile, above the B_2 horizon, would vary directly as the depth of topsoil.

Isopotal Maps

As a first trial, isopotal areas were estimated using the values obtained with the infiltrometer. The multiple regression equation was used to adjust for variation of antecedent soil moisture and temperature in order that all values might be comparable. From the regression equation the influence of antecedent soil moisture upon F was:

$$-0.041455X_3 - 0.042214X_4 + 0.051874X_5$$

When antecedent soil moisture was standardized at 10 percent in all three depths, the correction was:

$$F - 0.31795 + 0.041455X_3 + 0.042214X_4 - 0.51874X_5$$

TABLE 2.--Results of multiple regression analysis[1]

F[2] at 180 min. (Y)	Cover density (X_1)	Depth of topsoil (X_2)	Antecedent soil moisture			Soil temp. (X_6)	Plot slope (X_7)
			0 - 7 in. (X_3)	7 - 14 in. (X_4)	14 - 21 in. (X_5)		
Correlation of Y on X's	**0.3926	**0.6307	**-0.3767	**-0.3850	0.09141	0.1996	**-0.4518
Standard partial regression of Y on X's	.3441	.2295	-.2914	-.2637	.2513	-.0426	-.0770

$$R^2 = r_{y1}B_{y1}+r_{y2}B_{y2}+r_{y3}B_{y3}+r_{y4}B_{y4}+r_{y5}B_{y5}+r_{y6}B_{y6}+r_{y7}B_{y7}$$

$$= (0.3926)(0.3441)+(0.6307)(0.2295)+(-0.3767)(-0.2914)+(-0.3850)(-0.2637)$$

$$+ (-0.09141)(0.2513)+(0.1996)(-0.0426)+(-0.4518)(-0.0770)$$

$$= 0.1351 + 0.1447 + 0.1098 + 0.1015 - 0.0230 - 0.0085 + 0.0348$$

$$R^2 = 0.4944$$

$$R = 0.7031$$

Source of variation	Degrees of freedom	Sums of squares		Mean squares
		Symbolical	Numerical	
Linear regression.........................	7	R^2Sy^2	23.9064	3.4152
Deviation from regression................	46	$(1-R^2)Sy^2$	24.4480	.5315
Total................................	53	Sy^2	48.3544	---

* = 5-percent level of significance.

** = 1-percent level of significance.

[1] Snedecor, George W. Statistical Methods. Ed. 5. Iowa State College Press, Ames, Iowa. 1956.

[2] F = 3.4152/0.5315 = 6.4256**.

Similarly, the influence of temperature at a standardized soil temperature of 60° F. was:

$$-0.003906X_6$$

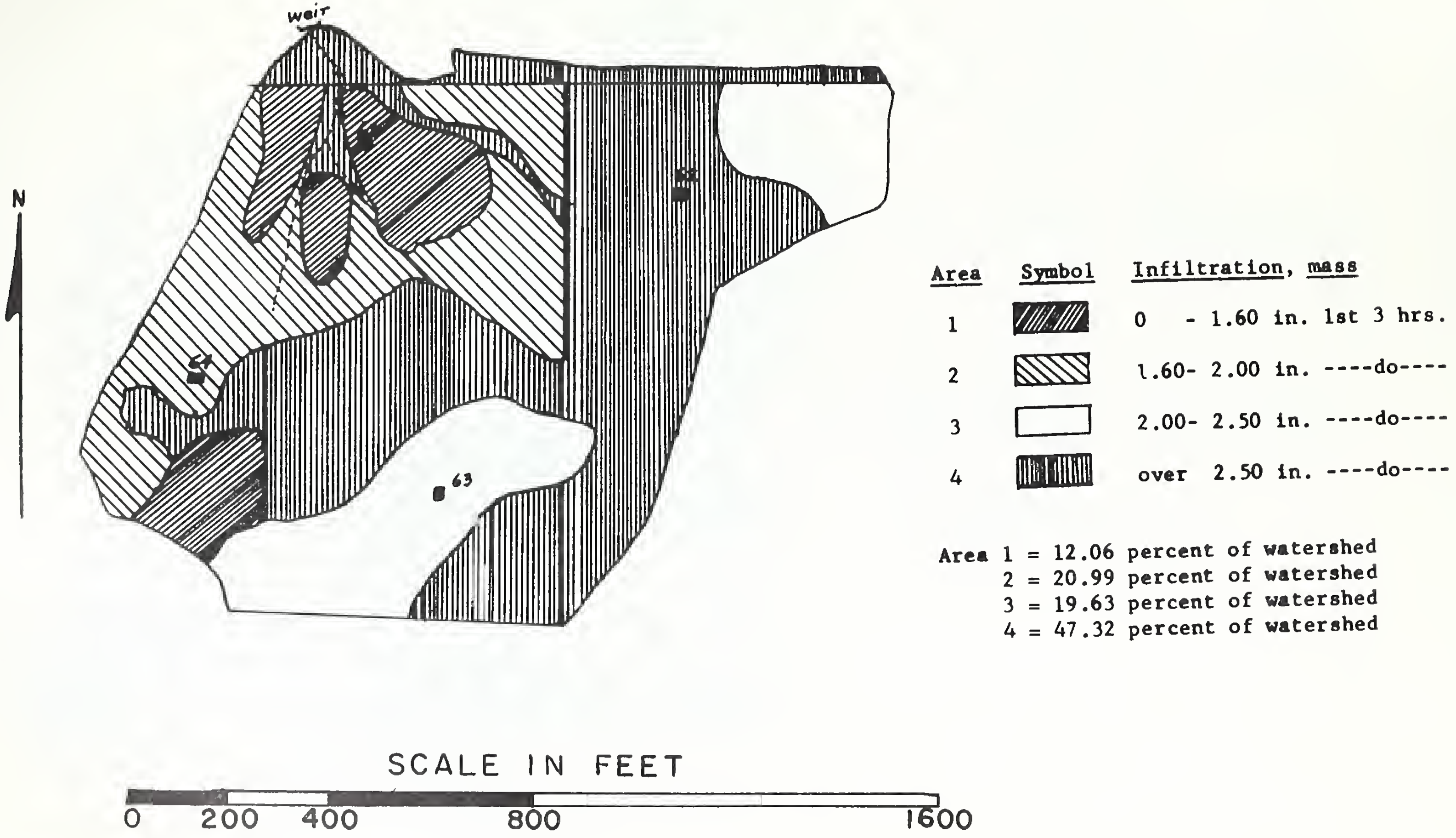
Correction to be added to F at 180 minutes is therefore:

$$0.003907(X_6 - 60) \text{ or } -0.23436 + 0.003906X_6$$

Hence the total amount to be added to F at 180 minutes to standardize antecedent soil moisture at 10 percent and soil temperature at 60° F. was:

$$-0.55231 + 0.041455X_3 + 0.042214X_4 - 0.051874X_5 + 0.003906X_6$$

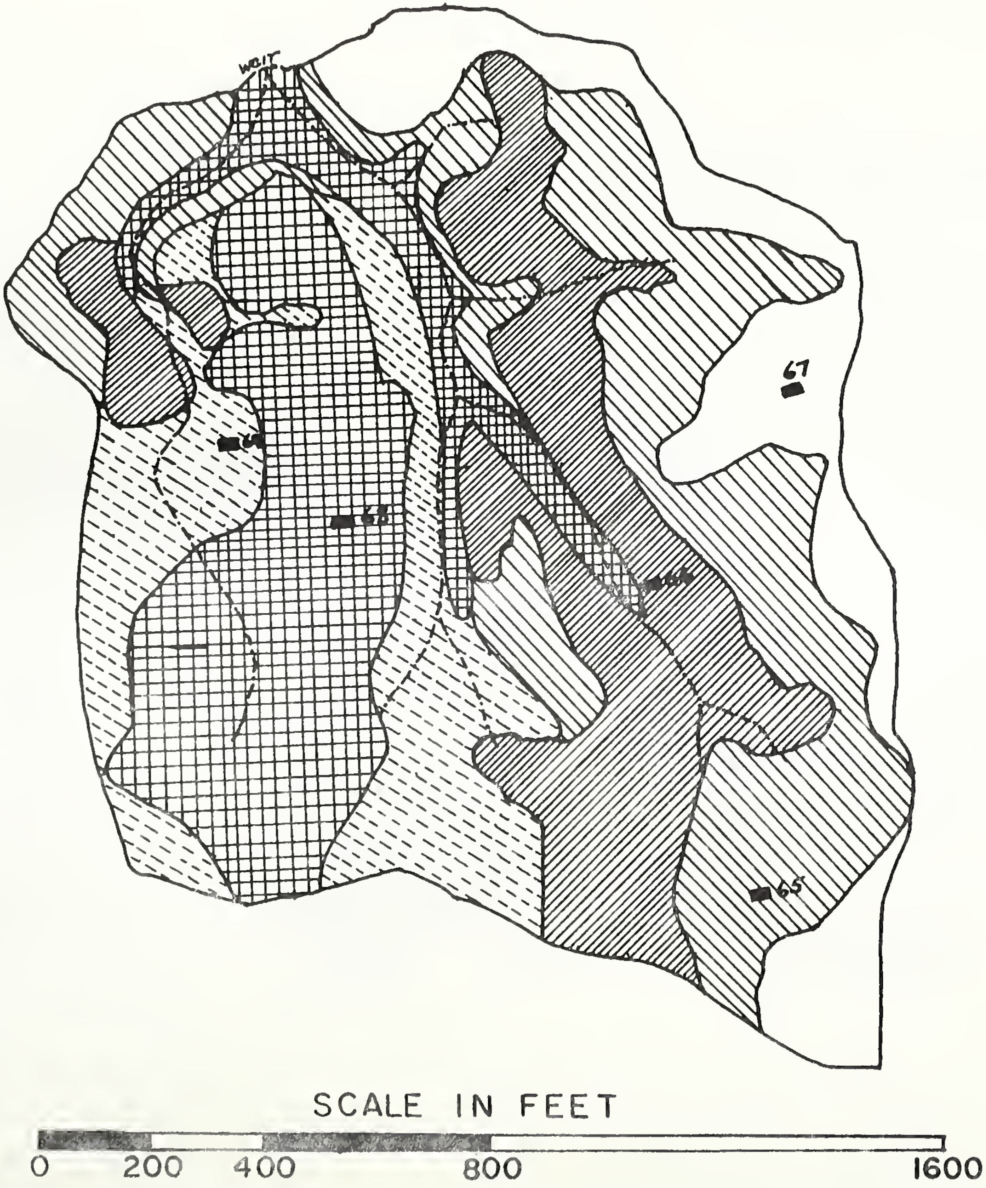
Infiltration values were thus adjusted and plotted on maps. Dissections by waterways posed problems in drawing isopotal lines from infiltrometer values alone. The less permeable, steep, eroded banks of waterways sometimes extended between two areas of indicated high infiltration. Each watershed was surveyed and mapped according to depth of topsoil and basal area of vegetative cover to obtain guidance in these intersite areas. Mass infiltration at 180 minutes was estimated by substituting these parameters into the multiple regression equation--standardizing temperature at 60° F. and antecedent soil moisture at 10 percent in all three depths. Isopotal maps shown in figures 5 and 6 were prepared from these estimates for watersheds I and II, respectively.



Area	Symbol	Infiltration, mass
1	▨	0 - 1.60 in. 1st 3 hrs.
2	▨	1.60- 2.00 in. ----do----
3	☐	2.00- 2.50 in. ----do----
4	▥	over 2.50 in. ----do----

Area 1 = 12.06 percent of watershed
2 = 20.99 percent of watershed
3 = 19.63 percent of watershed
4 = 47.32 percent of watershed

Figure 5.--Isopotal map giving plot locations for second period of the experiment on watershed I from infiltrometer values and estimates based on vegetative cover and depth of topsoil.



Antecedent soil moisture - 10 percent
Soil temperature - 60 °F.

Area	Symbol	Infiltration, mass
1	▩	0 to 1.5 in. 1st 3 hrs.
2	▧	1.5 to 2.0 in.---do---
3	☐	2.0 to 2.7 in.---do---
4	▨	Same as area 3 but different slope and cover.
5	▦	above 2.7 in. 1st 3 hrs.

Area 1 = 19.83 percent of watershed
2 = 25.68 percent of watershed
3 = 13.28 percent of watershed
4 = 16.89 percent of watershed
5 = 24.32 percent of watershed

Figure 6.--Isopotal map giving plot locations for second period of the experiment on watershed II from infiltrometer values and estimates based on vegetative cover and depth of top soil.

Plots were established in each isopotal area to represent the two watersheds in percentages of area as determined from planimeter measurements:

Watershed	Plot No.	Cover	Percentage of watershed area
I	61	alfalfa	12.06
	62	....do......	47.32
	63	....do......	19.63
	64	....do......	20.99
II	65	timothy	25.68
	66	lespedeza	19.83
	67	....do......	13.28
	68	bluegrass	24.32
	69	....do......	16.89

Seasonal Variation

Another objective of the infiltrometer survey was to determine the effects of season upon infiltration. Measurements from recurrent runs on the 16 semipermanent plots excluding plots 3 and 4 are tabulated in table 3. In view of wide variations in antecedent soil moisture, final rates of infiltration, f_c, were used to provide a comparable basis. The total amount of water in the soil at the time the infiltration rate became constant (infiltration + antecedent soil moisture in inches) is evident in table 3. At first glance there seems to be a seasonal trend of f_c values. However, when the volume of water in the soil and the final rate, f_c, are plotted against season as in figure 7, the amount of water in the soil is inversely related to f_c regardless of season.

The relationship between antecedent soil moisture and the volume of infiltration occurring before the rate of infiltration becomes constant is plotted in figure 8. The scatter of points at the upper end of the graph may be caused by the difficulty of obtaining accurate determinations of soil moisture near the wilting point. A strong inverse relationship is indicated between these two variables. Winters are usually accompanied by a high soil moisture content due to the dormant state of vegetation, and summers are accompanied by low soil moisture content. Other than this indirect relationship, these data reveal nothing further about seasonal differences.

TABLE 3.--Antecedent soil moisture, mass infiltration to time of constant rate, and final rate of infiltration

Time period	Plot No.	Volume weight of soil at--		Antecedent moisture at 0-21 in.	Mass infiltration at final rate	Final rate of infiltration
		0-7 in.	Subsoil			
		G./cc.	G./cc.	Pct.	In.	In./hr.
5-7-40 to 6-6-40	1	[1] 1.495^{e}	1.517^{e}	6.48	1.22	0.06
	2	1.495^{e}	1.517^{e}	6.49	1.24	.19
	5	1.472^{e}	1.409^{e}	6.56	1.46	.22
	6	1.491^{e}	1.464^{e}	6.30	1.54	.15
	7	1.476^{e}	1.338^{e}	7.56	1.43	.25
	8	1.467^{e}	1.527^{e}	7.57	1.11	.23
	9	1.414^{e}	1.439^{e}	6.72	1.54	.12
	11	1.467	1.549^{e}	5.80	4.30	.02
	12	1.457	1.417	5.63	2.40	.04
	13	1.443^{e}	1.518^{e}	7.29	2.57	.12
	14	1.423^{e}	1.416^{e}	6.27	1.18	.34
	15	1.498	1.530^{e}	5.82	1.73	.27
	16	1.447	1.530	6.04	2.35	.40
Total		19.045	19.171	84.53	24.07	2.41
Average		1.465	1.475	6.50	1.85	.19
6-17-40 to 7-13-40	1	1.526	1.514	5.63	1.73	.18
	2	1.438	1.454	4.98	2.13	.17
	5	1.488	1.608	4.37	1.25	.38
	6	1.460	1.474	4.62	2.73	.28
	7	1.580	1.473	3.71	2.21	.41
	8	1.588	1.475	3.37	2.93	.39
	9	1.430	1.452	2.86	5.11	.18
	10	1.506	1.451	4.37	4.05	.04
	11	1.479	1.582	4.76	4.07	.17
	12	1.498	1.465	4.32	4.28	.12
	13	1.438	1.545	3.85	5.01	.25
	14	1.495	1.568	4.24	3.72	.28
	15	1.489	1.453	4.16	2.15	.24
	16	1.436	1.409	3.90	2.11	.36
Total		20.851	20.923	59.14	43.48	3.45
Average		1.489	1.494	4.22	3.11	.25
7-15-40 to 8-20-40	1	1.544	1.681	4.41	2.03	.09
	2	1.436	1.556	4.28	2.15	.19
	5	1.436	1.492	3.00	2.64	.28
	6	1.450	1.619	3.18	4.53	.50
	7	1.500	1.411	2.77	4.13	.45
	8	1.543	1.461	2.79	4.62	.42
	9	1.474	1.471	2.66	7.52	.32
	10	1.321	1.415	4.70	3.24	.08
	11	1.417	1.423	6.05	4.65	.07
	12	1.482	1.406	6.19	3.70	0
	13	1.332	1.454	7.10	2.65	.22
	14	1.475	1.398	6.17	2.89	.28
	15	1.486	1.406^{e}	5.04	.90	.18
	16	1.480	1.406^{e}	5.91	.96	.10
Total		20.376	20.599	64.25	46.61	3.18
Average		1.455	1.471	4.59	3.33	.23
8-30-40 to 10-11-40	1	1.432	1.514	3.78	2.01	.05
	6	1.478	1.523	5.30	2.71	.36
	7	1.504	1.539	4.59	3.17	.25
	9	1.392	1.488	4.12	4.88	.34
	11	1.572	1.584	4.06	6.26	.08
	13	1.420	1.691	7.55	3.88	.20
	16	1.478	1.649	6.38	.80	.13
Total		10.276	10.988	35.78	23.71	1.41
Average		1.468	1.570	5.11	3.39	.20

TABLE 3.--Continued

Time period	Plot No.	Volume weight of soil at--		Antecedent moisture at 0-21 in.	Mass infiltration at final rate	Final rate of infiltration
		0-7 in.	Subsoil			
		G./cc.	G./cc.	Pct.	In.	In./hr.
10-16-40 to 12-21-40	2	1.490	1.668	5.51	1.82	0.30
	5	1.493	1.465	5.35	3.06	.16
	8	1.482	1.534	3.98	2.66	.24
	10	1.485	1.404	5.32	3.02	.18
	12	1.360	1.485	5.20	5.16	.05
	14	1.480	1.463	6.57	2.56	.14
	15	1.446	1.477	7.75	.42	.05
Total		10.236	10.496	39.68	18.70	1.12
Average		1.462	1.499	5.67	2.67	.16
2-12-41 to 4-26-41	1	1.288	1.295	6.55	.72	.11
	6	1.316^{e}	1.359^{e}	6.99	.97	.11
	7	1.321	1.373	6.76	1.04	.07
	9	1.283	1.272	7.32	1.70	.18
	11	1.292	1.362	7.61	1.31	.02
	13	1.340	1.286	6.61	1.42	.38
	16	1.268	1.406	7.10	1.73	.18
Total		9.108	9.353	48.94	8.89	1.05
Average		1.301	1.336	6.99	1.27	.15
6-10-41 to 7-24-41	1	1.495	1.517	4.04	1.86	.01
	2	1.495	1.517	5.01	2.55	.09
	5	1.472	1.409	5.04	2.88	.12
	6	1.491	1.464	5.95	3.00	.22
	7	1.476	1.338	3.26	6.20	.10
	8	1.467	1.527	3.75	6.05	.05
	9	1.414	1.439	4.19	5.64	.14
	10	1.448	1.405	4.49	4.81	.06
	11	1.444	1.549	2.65	6.92	.05
	12	1.444	1.549	3.90	6.37	.08
	13	1.443	1.518	6.14	6.18	.25
	14	1.423	1.416	5.59	5.69	.18
	15	1.467	1.530^{e}	4.99	2.58	.24
	16	1.568	1.530^{e}	4.88	.98	.37
Total		20.547	20.708	63.88	61.71	1.96
Average		1.468	1.479	4.56	4.41	.14
Averages of all periods	1	1.463	1.506	5.15	1.60	.08
	2	1.471	1.542	5.25	1.98	.19
	5	1.472	1.477	4.86	2.26	.23
	6	1.448	1.484	5.39	2.58	.27
	7	1.476	1.412	4.78	3.03	.26
	8	1.509	1.505	4.29	3.47	.27
	9	1.401	1.427	4.64	4.40	.21
	10	1.440	1.419	4.72	3.78	.09
	11	1.445	1.508	5.16	4.58	.07
	12	1.448	1.464	5.05	4.38	.06
	13	1.403	1.502	6.42	3.62	.24
	14	1.459	1.452	5.77	3.21	.24
	15	1.477	1.479	5.55	1.56	.20
	16	1.446	1.488	5.70	1.48	.26

[1] Exponent "e" after figure denotes estimated value.

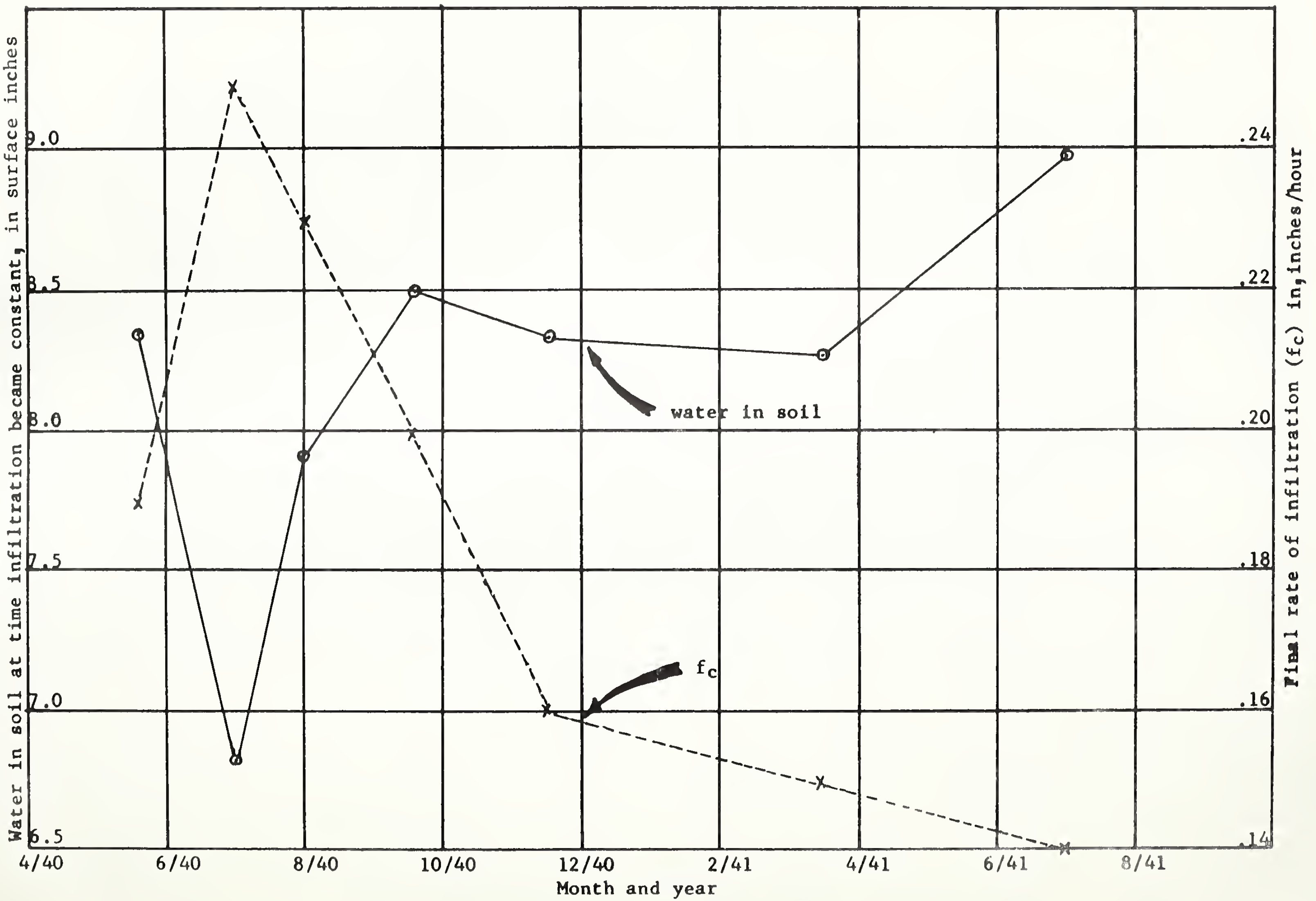


Figure 7.--Simultaneous relationship of final rate of infiltration and amount of water in surface 21 inches of soil to season. Averages of plots 1 to 16 for each period.

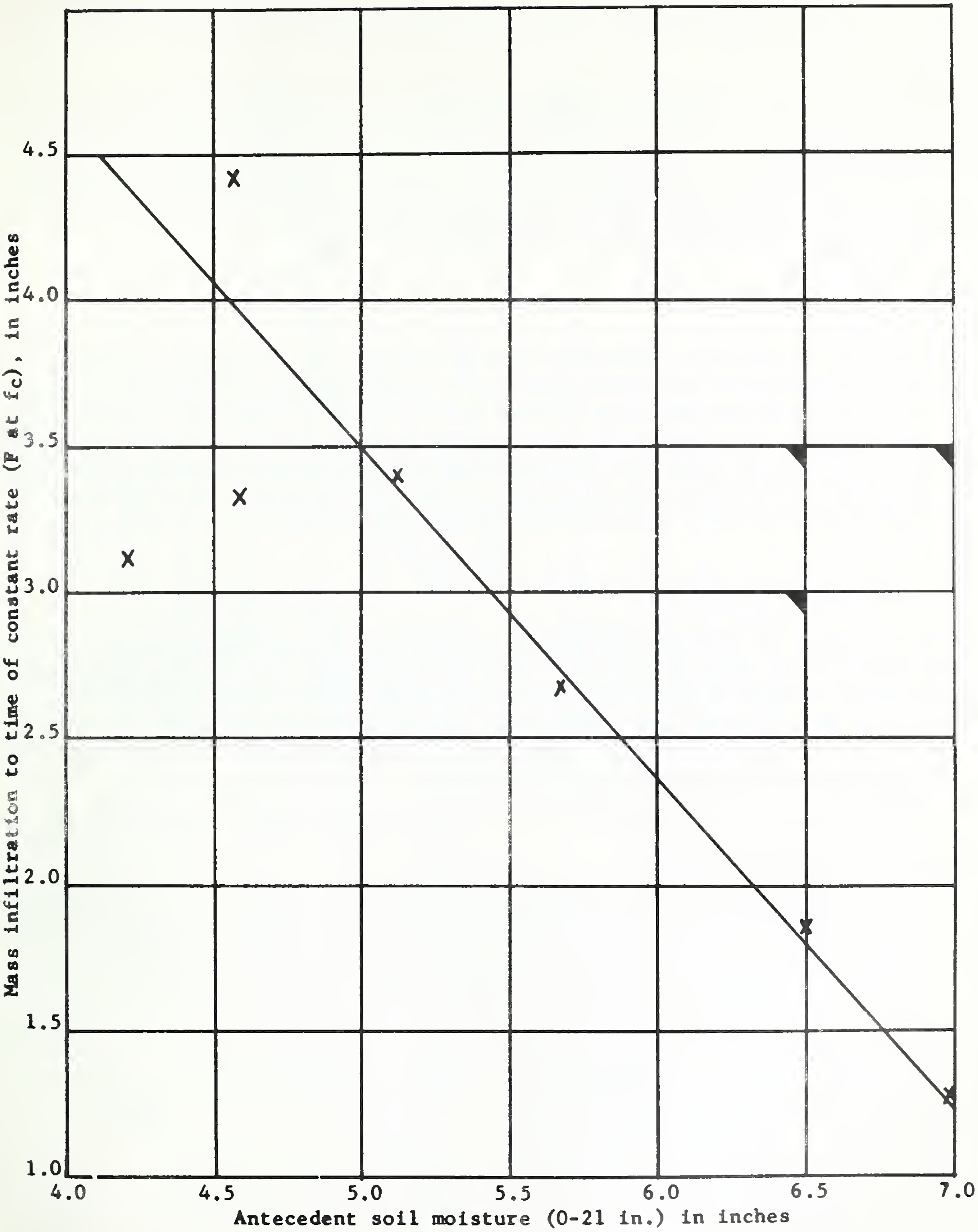


Figure 8.--Relationship between water in top 21 inches of soil and mass infiltration before final rate is reached. Averages of plots 1 to 16 for each period from table 3.

Infiltrometer Data for Estimating Runoff From Small Plots

Dispositions of rainfall on small plots include infiltration, depression storage, surface detention, evaporation, transpiration, canopy interception, and runoff. The infiltrometer has shed much light upon these phenomena and has provided means of evaluating most of them. In the following derivation of the mass runoff curve from the mass infiltration curve and measured mass rainfall, evaporation, transpiration, and canopy interception are included necessarily as depression storage (V_d). Rainfall then must supply some or all of the following phenomena: infiltration, depression storage (V_d), surface detention (D_a), and runoff.

Infiltration Capacity

For practical application, infiltration must be estimated for the specific conditions of any given storm. Figures 9 to 12 present mass curves of infiltration determined with the infiltrometer during the recurrent runs on the 16 plots listed in table 4. A number of vegetative covers, soils, and slopes are represented with a range of antecedent soil moisture conditions and various seasons represented for each. The most applicable plot and moisture condition is determined from table 4 and the corresponding mass curve of infiltration is found in one of the figures 9 to 12. Rainfall excess is obtained by subtracting infiltration from rainfall.

Surface Detention

Figures 13 to 16 present relationships between rate of runoff and surface detention for various infiltrometer runs on each plot. They are included for use in routing rainfall excess through surface storage to derive the curve of plot runoff. Related runoff rates (q) and surface detention (D_a) were obtained from infiltrometer hydrographs during the runoff recession after the sprinkler had been stopped. Each rate of runoff during the recession was plotted against the volume of detention as indicated by subsequent runoff.

Applications in Computing Runoff

The storm of October 22, 1941, is used to illustrate the procedure on natural rainfall plots 61, 63, and 69 installed for part II of the study. The same procedure is followed for each plot; hence, only plot 61 is discussed. In figure 17 the mass curve of rainfall was plotted on cross-sectional tracing paper. As shown in appendix table 21, plot 61 has alfalfa cover, 11.15-percent slope, and 5 inches of topsoil. Infiltrometer plot 1 most nearly meets these conditions (table 4). Antecedent soil moisture was very high for the storm of October 22 as indicated by previous rains. Two inches of rainfall occurring October 17 to 21 made this storm of October 22 comparable to a wet run on the infiltrometer plot for the same season. From table 4, infiltrometer run 5 of August 31, 1940, (a wet run on plot 1) was deemed the most applicable to conditions preceding the storm of October 22, 1941.

The mass infiltration of plot 1 (fig. 9), run 5, was transplotted on graph paper, which had the same scale as that used for mass rainfall. The mass rainfall graph was then superimposed on the mass infiltration graph. While the base lines were kept coincident, the rainfall curve was moved until the two curves intersected at the first point where the slope of mass rainfall became greater than the slope of mass infiltration. The mass infiltration capacity curve from figure 9 was traced onto figure 17 to the point where the slope of rainfall again became zero or less than the slope of infiltration. At this second point, the limit of infiltration opportunity was determined by adding V_d (from table 4) to mass infiltration. If rainfall continued, but at a rate less than infiltration capacity; or if rainfall ceased, the limit of infiltration opportunity became a line through

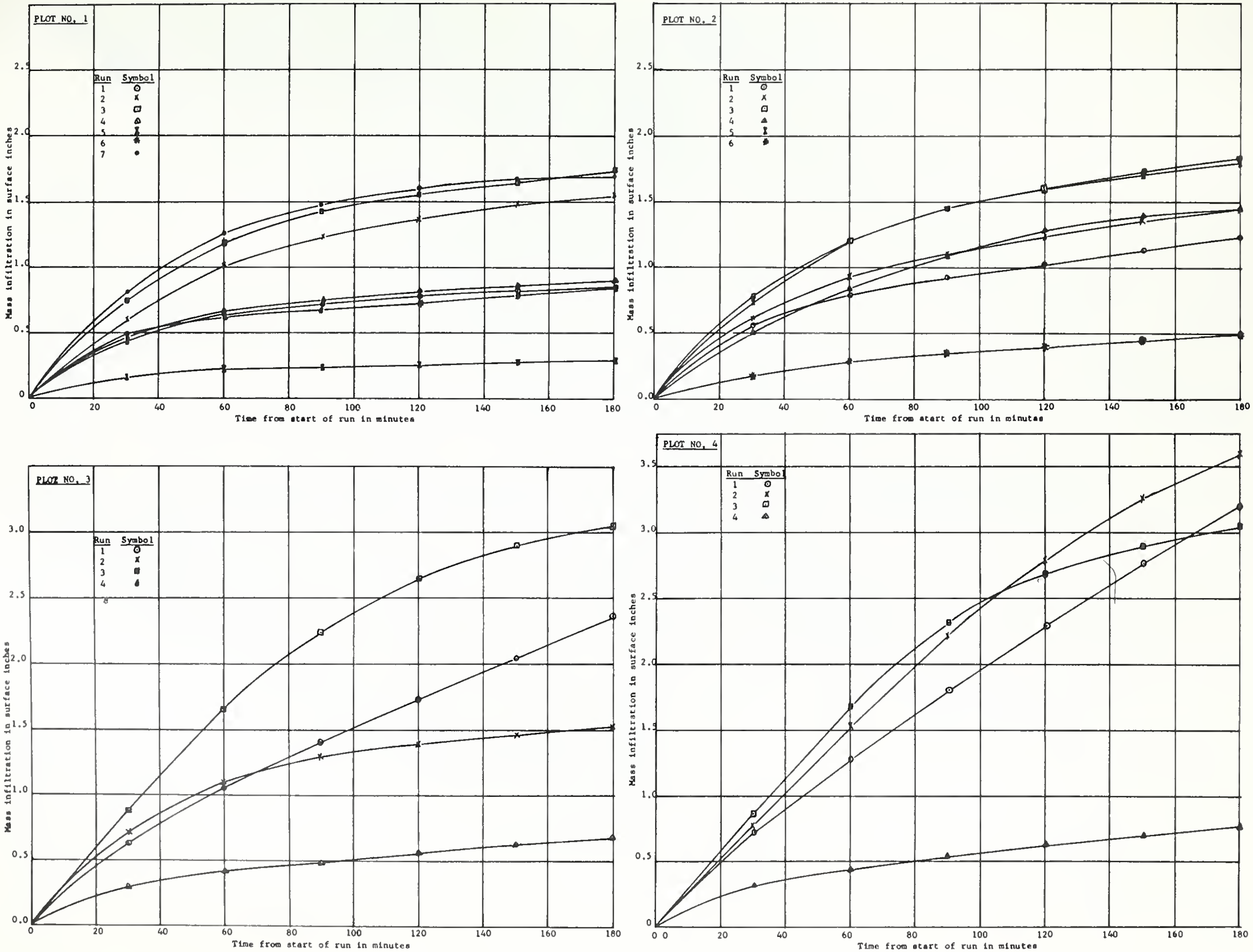


Figure 9.--Mass infiltration curves for infiltrometer plot runs for plots 1 to 4.

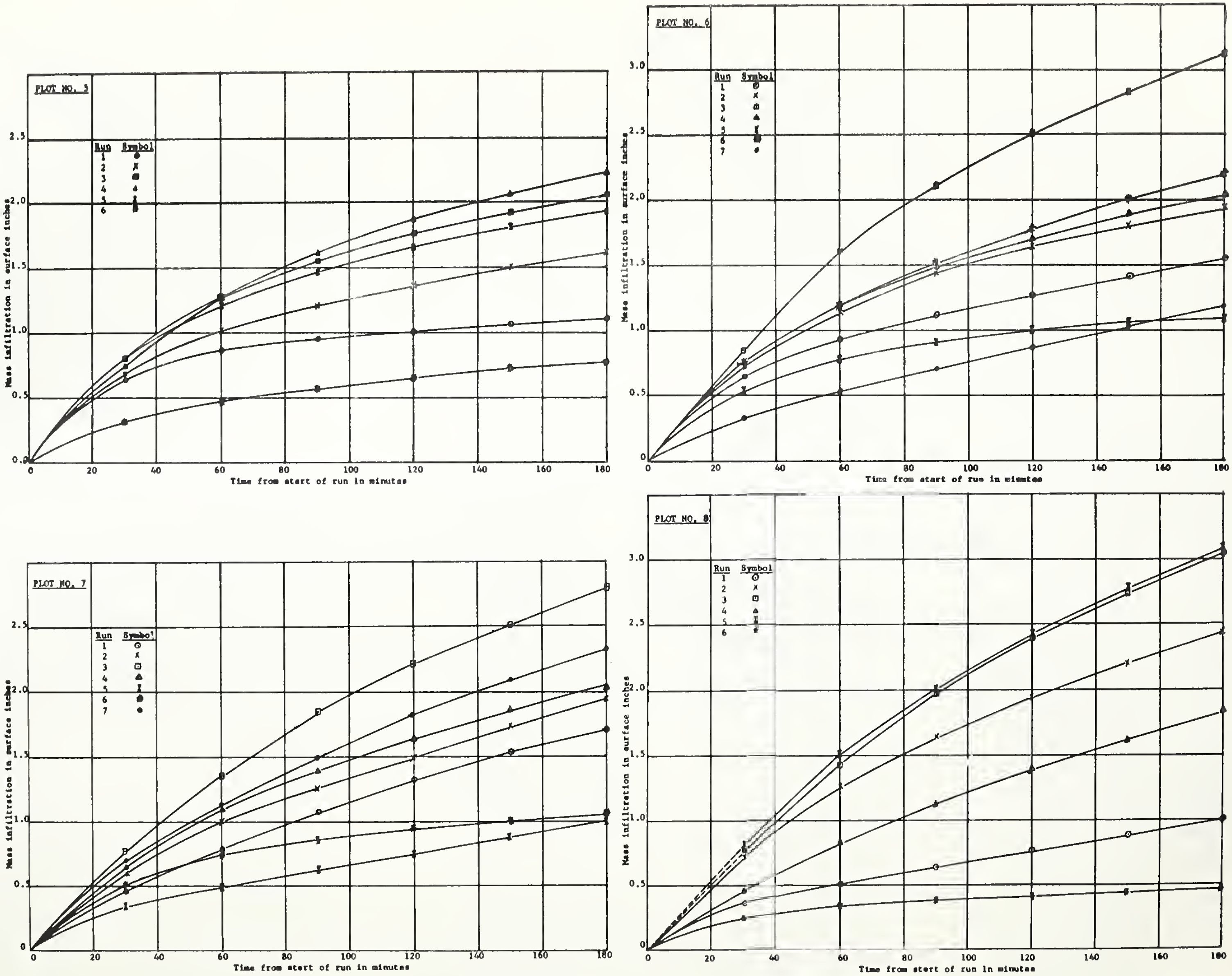


Figure 10.--Mass infiltration curves for infiltrometer plot runs for plots 5 to 8.

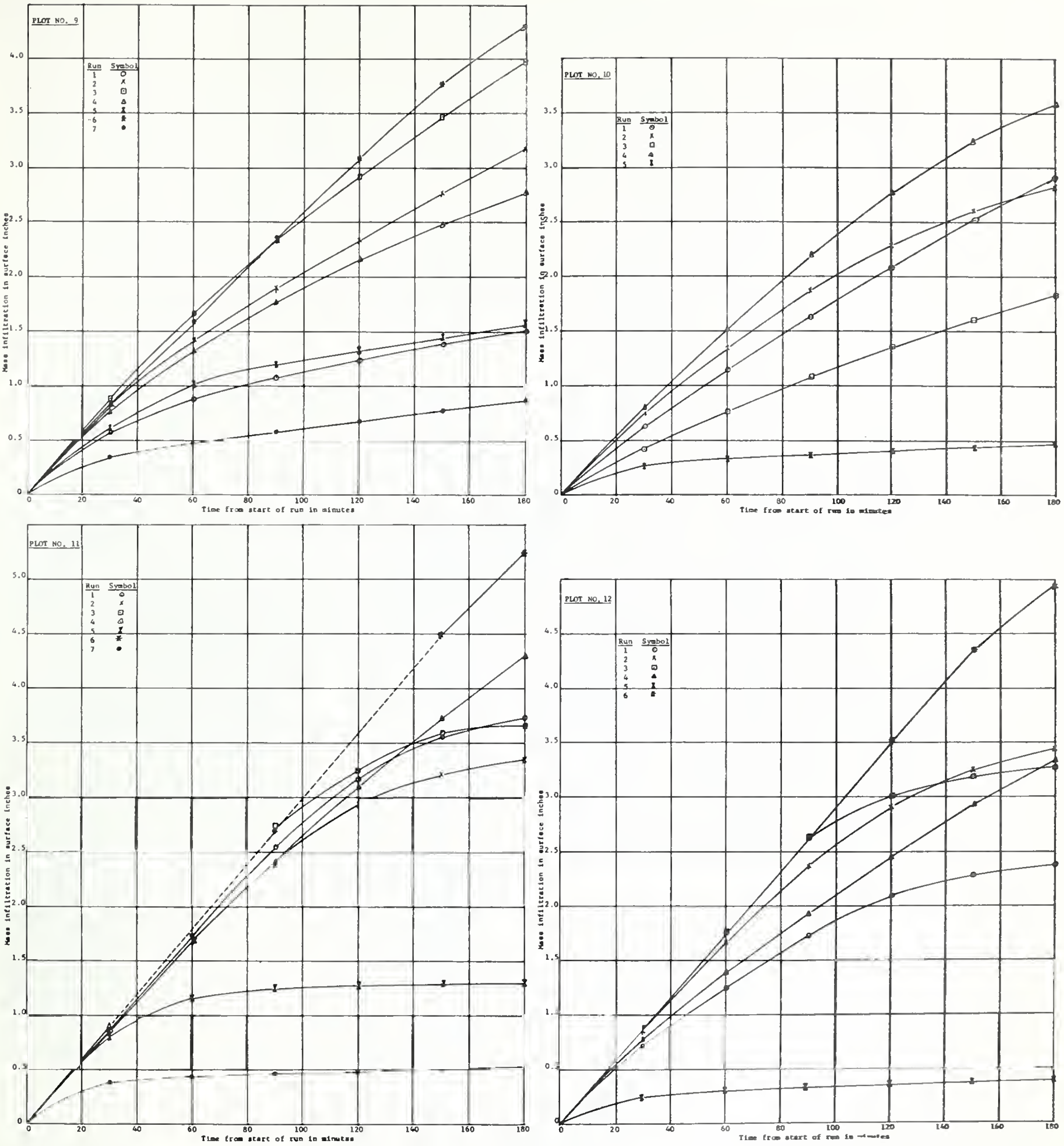


Figure 11.--Mass infiltration curves for infiltrometer plot runs for plots 9 to 12.

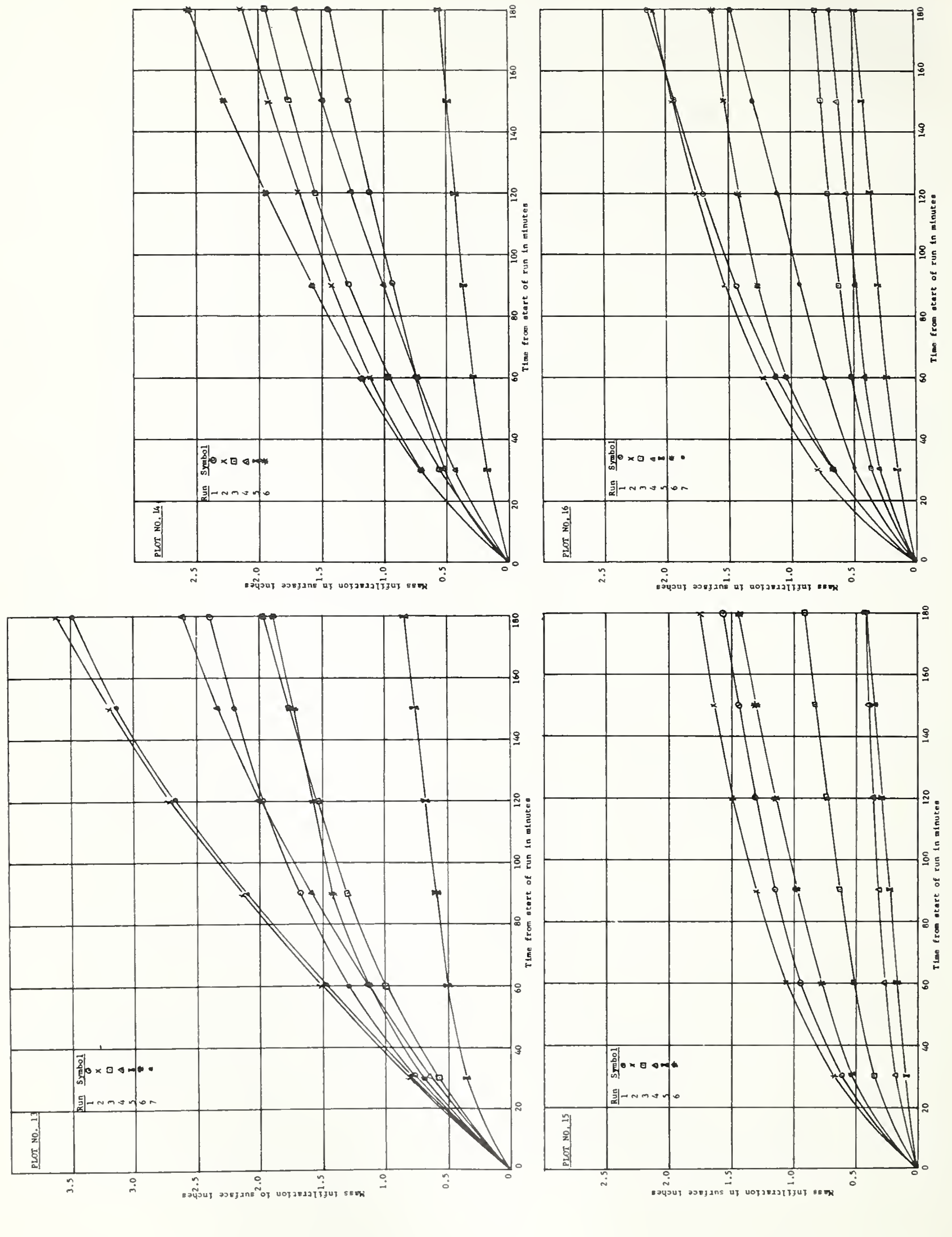


Figure 12.--Mass infiltration curves for infiltrometer plot runs for plots 13 to 16.

TABLE 4.--Choice of mass infiltration curves for homogeneous areas for any specific storm on watersheds I and II, Edwardsville, Ill.

[Data plotted in figures 9 to 12]

Plot No.	Cover	Slope	Depth of top soil	Run No. and date of run	Antecedent soil moisture at			V_d[1]	f_c[2]
					0-7 in.	7-14 in.	14-21 in.		
		Pct.	In.		Pct.	Pct.	Pct.	In.	In.
1	Alfalfa (old)	11.72	4	1 5-17-40	19.6	21.1	20.6	0.03	0.19
				2 6-17-40	17.2	19.3	16.5	.07	.18
				3 7-17-40	11.0	14.5	12.9	.03	.09
				4 8-30-40	13.4	11.0	12.0	.04	.05
				5 8-31-40	22.8	14.2	12.3	.04	.05
				6 2-12-41	25.0	24.4	23.0	.02	.11
				7 6-10-41	13.3	13.3	11.6	.04	.01
2	Alfalfa (old)	9.62	7	1 5-16-40	18.6	20.6	22.2	.03	.19
				2 6-18-40	13.6	16.5	19.0	.05	.17
				3 7-15-40	12.3	14.0	14.0	.06	.19
				4 10-16-40	20.4	14.8	13.2	.04	.29
				5 6-11-41	16.8	15.4	15.2	.04	.09
				6 6-12-41	26.6	24.6	20.0	.04	.09
3	Alfalfa (new)	0.83	14	1 8-26-40	10.7	12.7	16.0	.12	.50
				2 3-14-41	26.5	24.5	26.0	.14	.13
				3 6-4-41	11.4	19.8	25.4	.15	.12
				4 6-5-41	28.6	26.0	25.6	.15	.12
4	Alfalfa (new	1.30	14	1 8-22-40	16.1	16.6	17.7	.19	.52
				2 10-21-40	17.0	15.0	19.8	.18	.34
				3 6-2-41	11.6	14.2	22.8	.09	.10
				4 6-3-41	26.4	26.5	27.0	.10	.10
5	Alfalfa (old)	1.22	15	1 5-21-40	21.3	21.5	22.8	.08	.22
				2 6-19-40	10.8	11.7	17.1	.12	.38
				3 7-19-40	5.8	7.9	15.3	.16	.28
				4 10-20-40	16.5	15.4	20.0	.11	.16
				5 6-20-41	15.6	15.6	19.2	.09	.12
				6 6-21-41	27.6	27.3	27.2	.09	.12
6	Alfalfa (old)	1.00	14	1 5-22-40	19.7	19.2	22.2	.09	.15
				2 6-20-40	11.9	12.8	20.2	.18	.28
				3 7-23-40	5.1	6.8	16.7	.08	.50
				4 9-13-40	13.5	15.6	21.0	.06	.36
				5 3-10-41	26.5	24.5	23.3	[3] .08	.11
				6 6-18-41	16.4	17.1	24.3	.07	.22
				7 6-19-41	25.5	25.8	24.5	.07	.22
7	Timothy	1.36	18	1 5-7-40	27.6	26.4	23.9	.10	.25
				2 6-25-40	5.8	15.1	14.7	.10	.41
				3 7-29-40	4.3	8.0	15.5	.10	.45
				4 9-18-40	10.2	13.8	18.8	.09	.25
				5 9-19-40	20.4	23.2	21.8	.09	.25
				6 3-19-41	25.1	21.7	24.5	.01	.07
				7 6-24-41	5.8	8.2	20.2	.12	.10
8	Timothy	1.30	17	1 5-9-40	25.6	23.3	23.2	0.14	0.23
				2 6-26-40	5.9	7.9	18.4	.16	.39
				3 8-1-40	3.8	6.0	17.3	.12	.42
				4 11-7-40	8.5	9.5	19.4	.14	.24
				5 6-27-41	5.2	9.7	20.4	.11	.05
				6 6-28-41	27.1	25.6	26.9	.11	.05
9	Bluegrass	8.27	12	1 5-23-40	23.3	21.5	22.8	.06	.12
				2 6-27-40	6.6	8.2	13.4	.11	.18
				3 8-2-40	4.7	8.0	13.2	.10	.32
				4 9-23-40	6.8	13.1	20.1	.06	.34
				5 3-20-41	27.9	25.5	28.6	.06	.18
				6 7-1-41	14.8	11.7	15.4	.06	.14
				7 7-2-41	27.9	26.4	25.8	.06	.14

TABLE 4.--Continued

Plot No.	Cover	Slope	Depth of top soil	Run No. and date of run	Antecedent soil moisture at			V_d[1]	f_c[2]
					0-7 in.	7-14 in.	14-21 in.		
		Pct.	In.		Pct.	Pct.	Pct.	In.	In.
10	Bluegrass	8.30	7	1 6-29-40	13.1	11.4	18.0	.06	.04
				2 8-5-40	17.1	13.4	16.9	.11	.08
				3 11-29-40	27.4	22.5	22.7	.06	.18
				4 7-2-41	14.2	12.6	18.4	.003	.06
				5 7-3-41	27.6	27.1	28.2	.003	.06
11	Bluegrass	1.25	16	1 6-6-40	17.2	18.1	19.1	.08	.02
				2 7-1-40	12.6	13.9	17.3	.12	.17
				3 8-7-40	20.8	21.2	17.8	.08	.07
				4 9-30-40	7.6	12.6	16.5	.10	.08
				5 3-21-41	29.5	27.2	24.6	.06	.02
				6 7-8-41	7.9	9.0	8.1	.08	.05
				7 7-9-41	29.0	29.5	25.8	.08	.05
12	Bluegrass	1.67	20	1 6-5-40	19.3	19.9	19.5	.07	.04
				2 7-2-40	13.2	13.4	15.3	.09	.12
				3 8-9-40	22.8	20.8	18.1	.03	0
				4 11-20-40	17.8	15.0	18.7	.05	.05
				5 11-21-40	31.9	29.0	25.6	.05	.05
				6 7-10-41	13.6	12.2	11.1	.06	.08
13	Bluegrass	15.25	10	1 5-27-40	23.8	22.2	23.2	.05	.12
				2 7-8-40	6.7	12.9	16.5	.11	.25
				3 8-13-40	24.4	22.8	24.6	.08	.22
				4 10-7-40	24.3	21.8	21.6	.07	.20
				5 10-8-40	26.8	26.3	25.6	.07	.20
				6 3-22-41	27.5	20.0	24.8	.05	.38
				7 7-15-41	21.2	19.8	17.8	.04	.26
14	Bluegrass	16.83	8	1 5-28-40	17.2	22.9	23.1	.05	.34
				2 7-9-40	9.0	14.7	15.4	.07	.28
				3 8-15-40	22.7	19.2	19.9	.04	.28
				4 12-9-40	21.3	22.2	20.4	.04	.14
				5 12-10-40	26.1	27.4	23.3	.04	.14
				6 7-17-41	17.4	21.5	17.4	.04	.18
15	Lespedeza	12.11	2	1 6-3-40	10.4	20.6	24.0	.06	.27
				2 7-10-40	7.5	14.8	18.5	.08	.24
				3 8-19-40	14.3	17.5	18.6	.02	.18
				4 12-20-40	24.7	26.0	24.8	.02	.05
				5 12-21-40	11.4	16.3	19.4	.02	.05
				6 7-21-41	22.8	22.1	22.3	.04	.24
16	Lespedeza	11.11	3	1 6-4-40	13.4	21.8	21.9	.08	.40
				2 7-12-40	7.2	14.9	17.4	.06	.36
				3 8-20-40	16.4	20.8	22.0	.03	.10
				4 10-11-40	19.2	21.6	16.5	.02	.13
				5 10-12-40	22.0	19.0	19.4	.02	.13
				6 3-26-41	20.2	25.2	28.7	.02	.18
				7 7-23-41	11.3	16.2	17.8	.05	.37

[1] V_d = depression storage.

[2] f_c = final rate of infiltration.

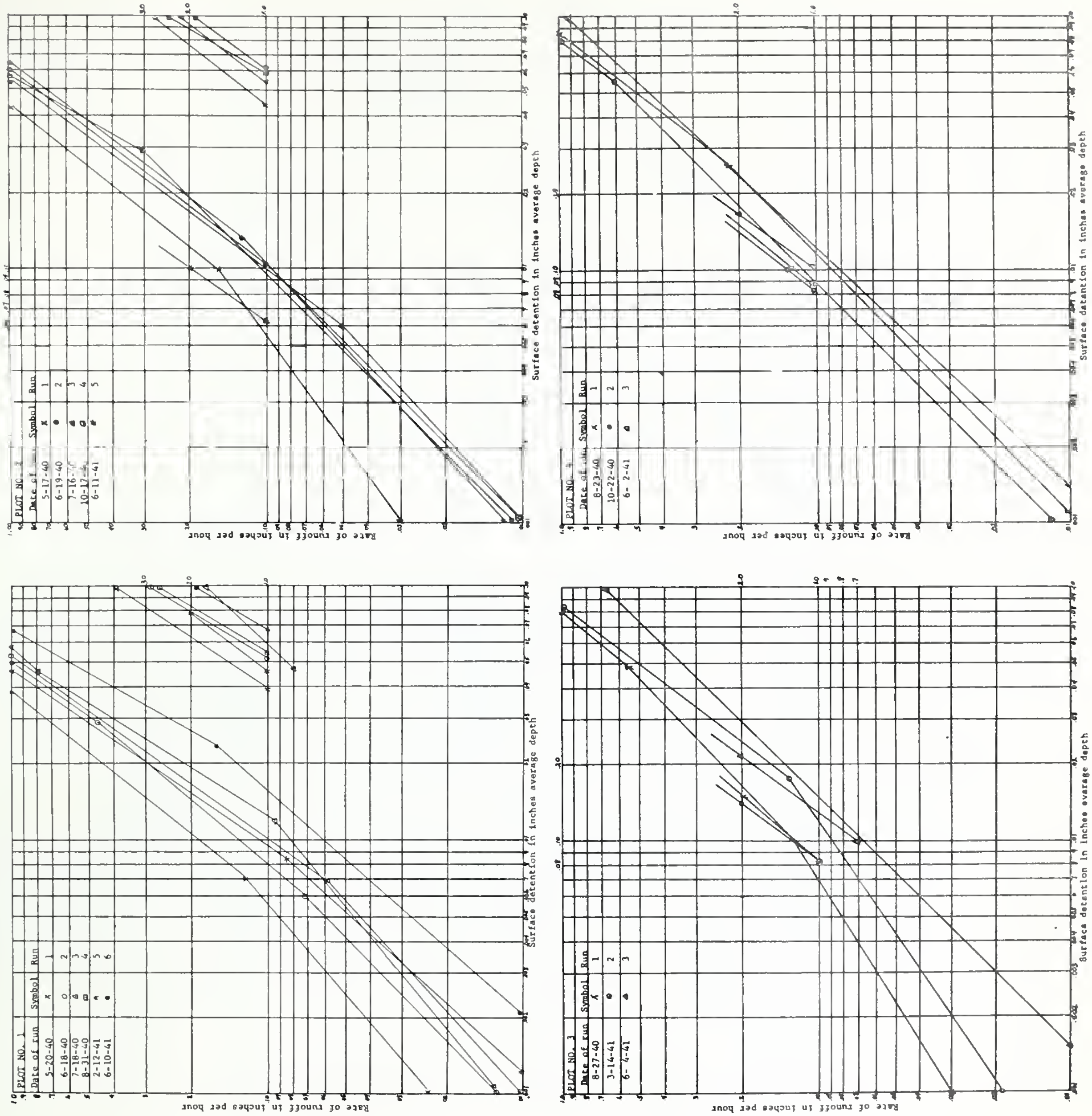


Figure 13.--Relationship of surface detention to rate of runoff for plots 1 to 4.

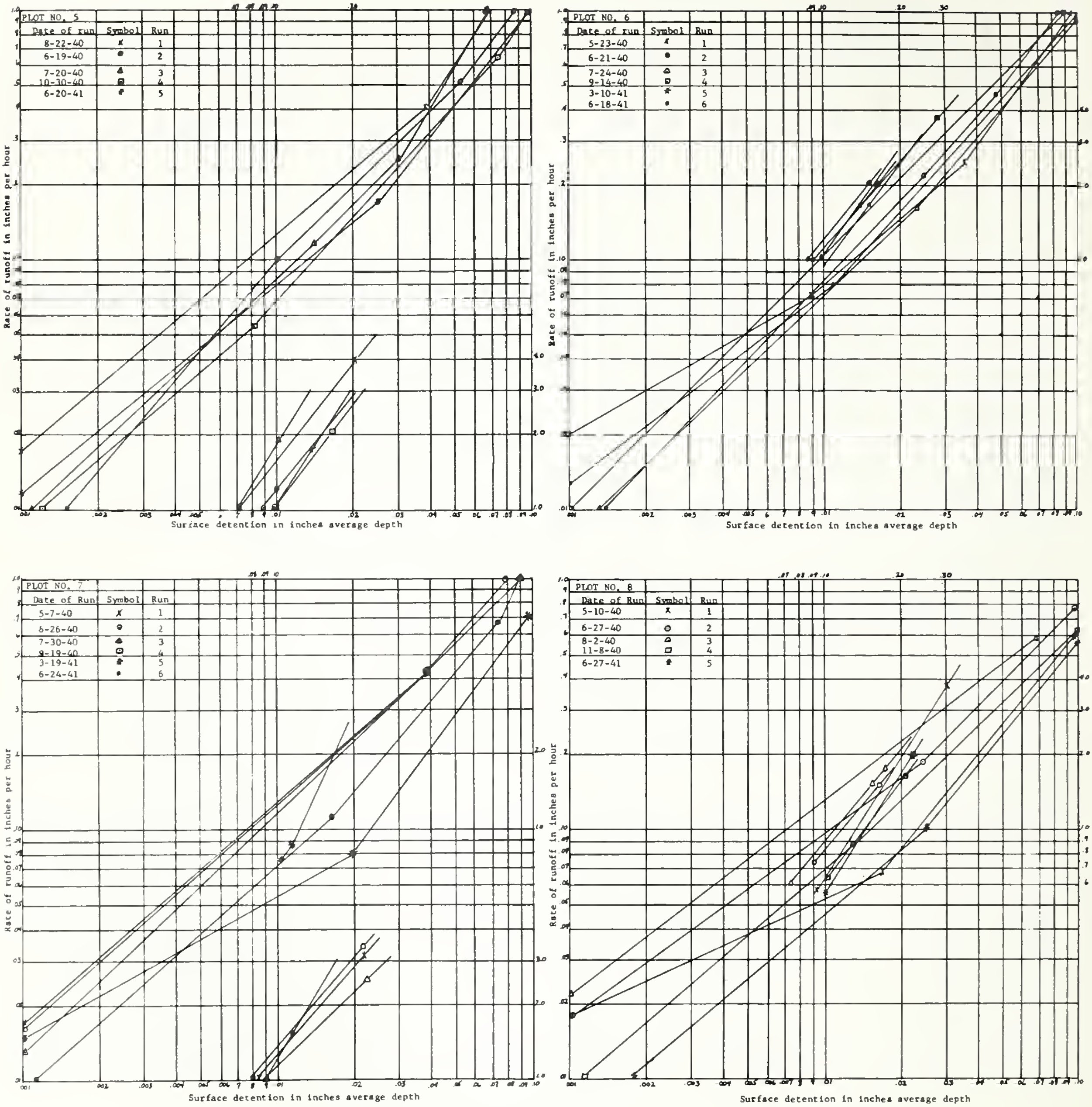


Figure 14.--Relationship of surface detention to rate of runoff for plots 5 to 8.

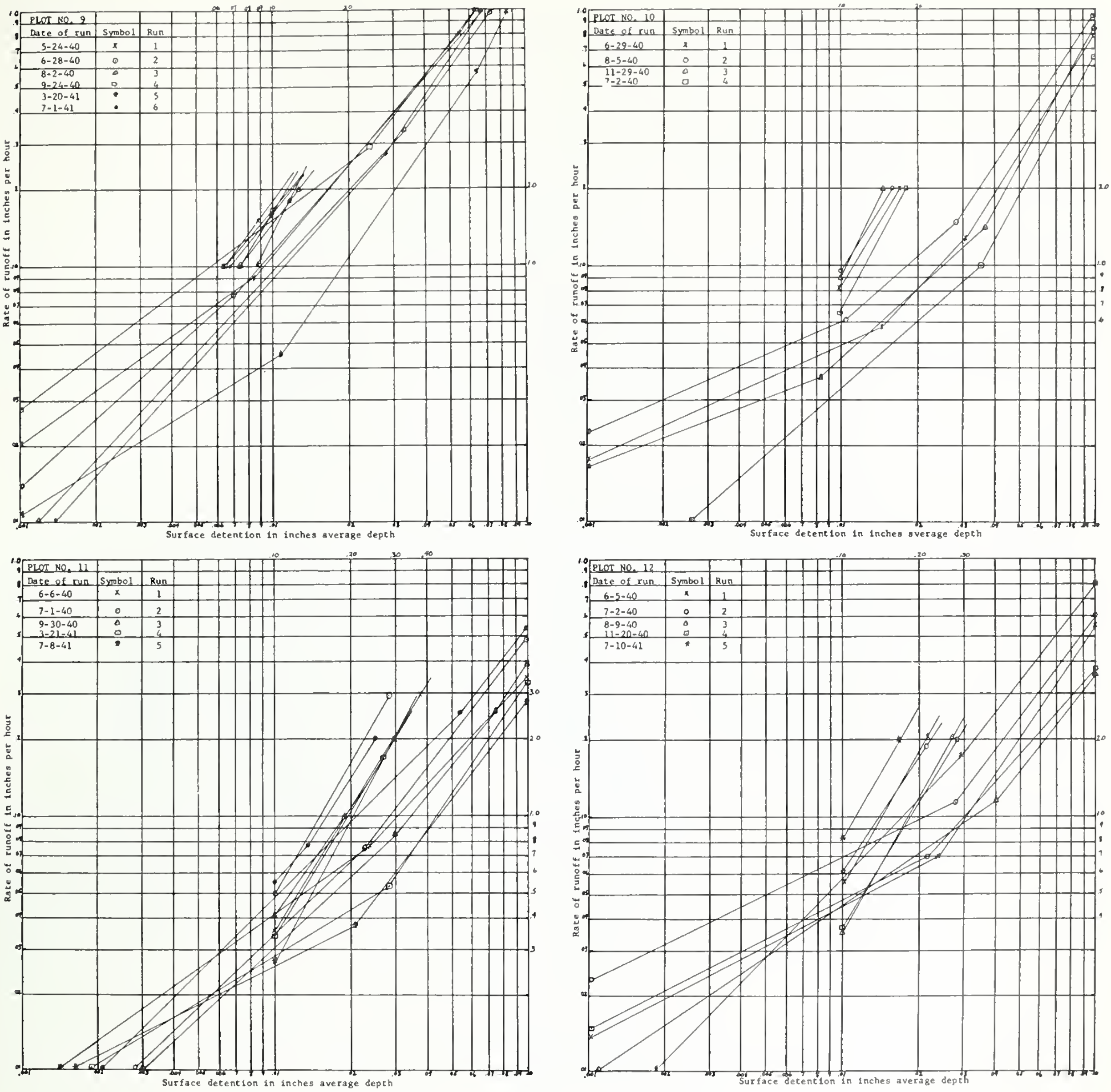


Figure 15.--Relationship of surface detention to rate of runoff for plots 9 to 12.

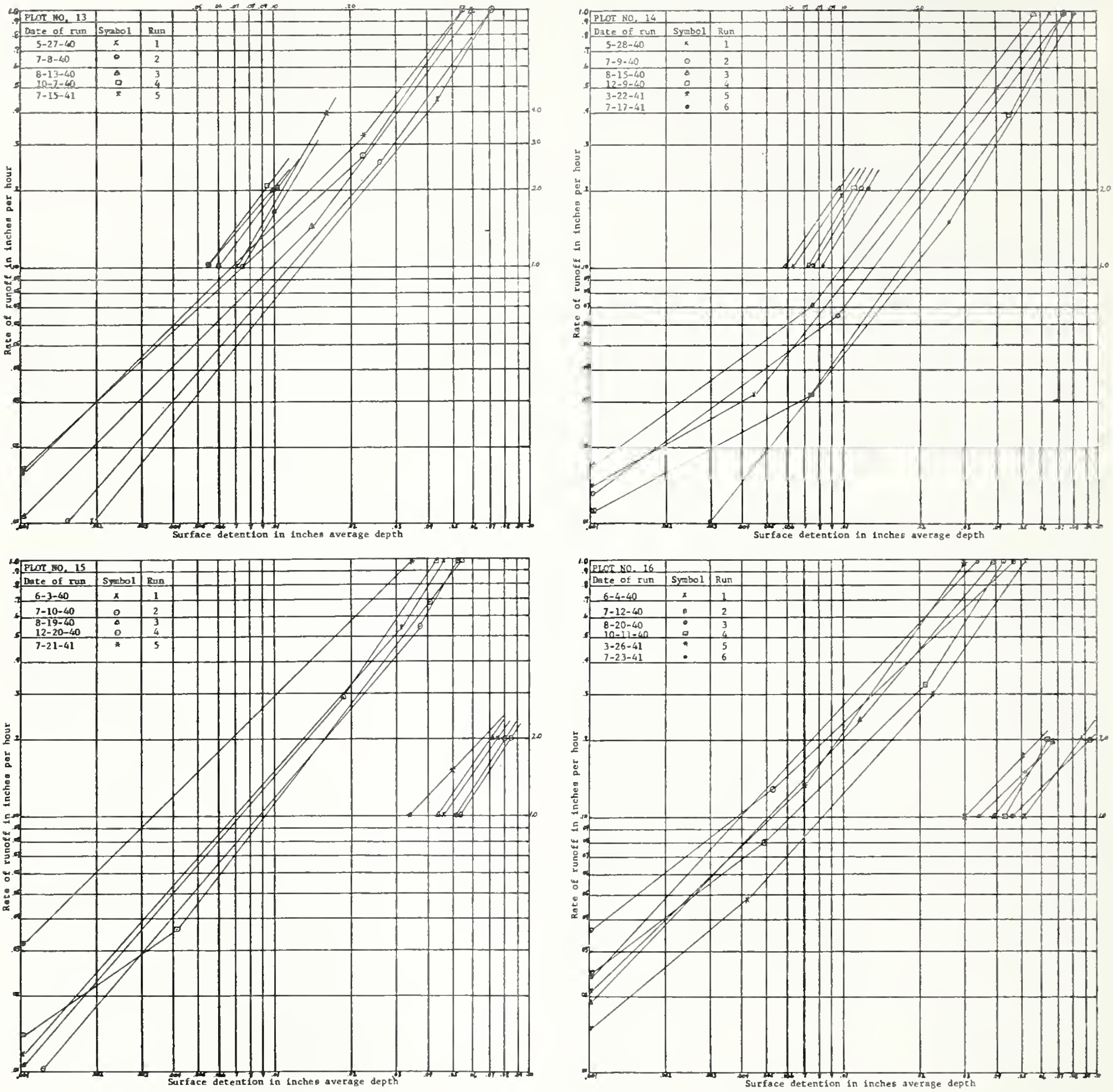


Figure 16.--Relationship of surface detention to rate of runoff for plots 13 to 16.

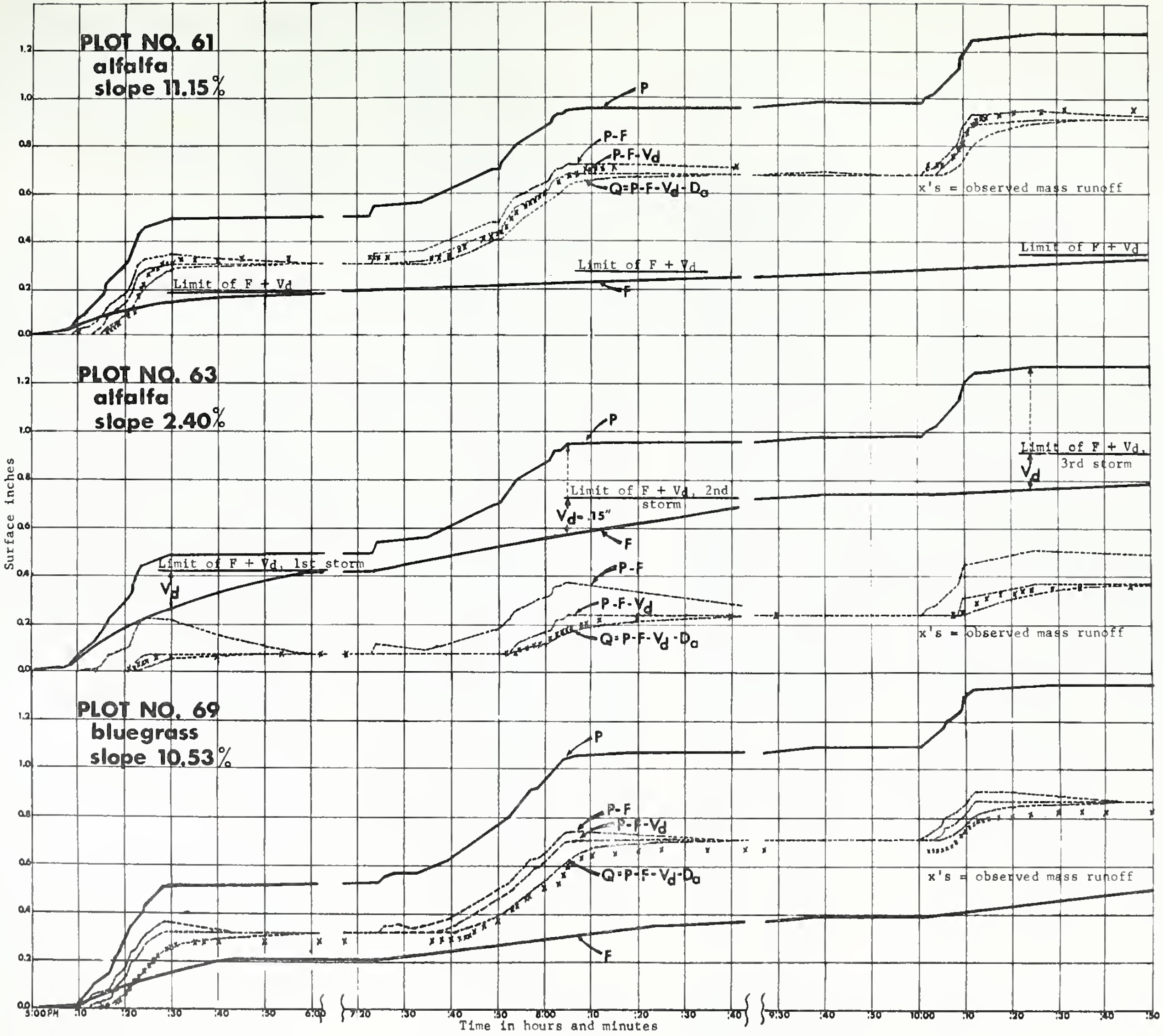


Figure 17.--Comparison of observed runoff with runoff computed from observed rainfall and infiltration curves from infiltrometer survey data, storm of Oct. 22, 1941, antecedent soil moisture--very wet: (a) Plot 61, ''F'' curve from infiltrometer plot 1, August 31, 1940 (fig. 9); (b) plot 63, ''F'' curve from infiltrometer plot 5, June 21, 1941 (fig. 10); (c) plot 69, ''F'' curve from infiltrometer plot 14, Dec. 10, 1940 (fig. 12).

this point parallel to subsequent mass rainfall. The infiltration curve was then traced until it intersected this limiting line. This line continued as the upper limit of infiltration until rainfall intensity again exceeded the infiltration capacity. The infiltration graph was moved sideward as before, keeping base lines coincident, until mass infiltration intersected the limit line at the point where rainfall again became excessive and the process was repeated to the end of the storm.

With a pair of dividers the differences between the two curves, mass rainfall and mass infiltration, were plotted as (P-F). The resulting curve represents excess rainfall which must supply depression storage (V_d), surface detention (D_a), and mass runoff (Q). Depression storage was subtracted from the (P - F) curve to the time of the maximum value of (P - F) for the first shower. From this point it was extended as a straight horizontal line until it intersected (P - F). The curve of (P - F - V_d) progressed then as a subtraction of V_d from the (P-F) curve for all rises of the (P-F) curve and as a straight horizontal line whenever (P-F) was receding.

The curve (P - F - V_d) represents rainfall excess that is free to run off the plot. Rainfall excess was routed through surface overland flow by applying the continuity equation:

$$\text{Runoff} = \text{rainfall excess} \pm \text{changes in detention}$$

The detention-flow relationship for infiltrometer plot 1, run 5 of figure 13 is applicable.

Figure 17 illustrates the results of these computations compared to observed runoff from the storm for plots 61, 63, and 69. The observed runoff is plotted as X's from data tabulations shown in tables 21, 23 and 29 of the appendix. The agreement between observed and derived curves of mass runoff is evidence of the possible applicability of infiltrometer data to natural rainfall.

PART II--RAINFALL-RUNOFF STUDIES

The objectives of rainfall-runoff studies were: (1) to learn the relationship between the hydrographs of the watersheds and the hydrographs of small sample plots, located within the isopotal areas of the watersheds, for the same storm, (2) to learn the relationship between infiltration and site variables such as antecedent soil moisture, soil temperature, soil structure, and vegetative cover, and (3) to determine range and occurrence of seasonal variation in infiltration.

Apparatus for Natural Rainfall Plots

Equipment for measuring natural rainfall and runoff was installed at the end of the infiltrometer survey of the two watersheds. Friez 6-inch capacity, nonreversing, recording rain and snow gages were used to provide a graph of rainfall. One gage was located at each plot (fig. 18) to record storm distribution over the two watersheds. Rain gages 9, 11, and 14 had 11 5/16-inch-diameter tops (fig. 19) and 6-hour charts added to increase the scale of measurement by an increment of 0.0125 inch of rain per 0.5 minute. The three gages with larger tops were located at plots chosen to provide a record representative of all runoff plots in the watershed areas. The total capacity was reduced to 3 inches due to the enlarged top. Similar gages with 8-inch-diameter tops and 6-hour clocks were used at other plots to measure rains 6 inches or less. Four standard gages also shown in figure 19 were spotted over the area and placed adjacent to recording gages.

Friez type FW-1 water stage recorders were used to graph the accumulative runoff from each plot. The usual 12-inch circumference float wheel was replaced with a 6-inch circumference float wheel operating the pen arm (fig. 20); thus the traverse of the pen was doubled for an increment of stage in the catchment tank. With the smaller wheel an increment of 0.12-inch rise in the tank could be read from the chart. With a 6-hour clock and chart, an increment of 0.12-inch-per-minute rise in tank could be read.

Two tanks, 29.7 inches in diameter and having 45 inches of available depth, were installed in tandem at each plot as shown in figure 19. The cross-sectional area of each tank equals 1/15th

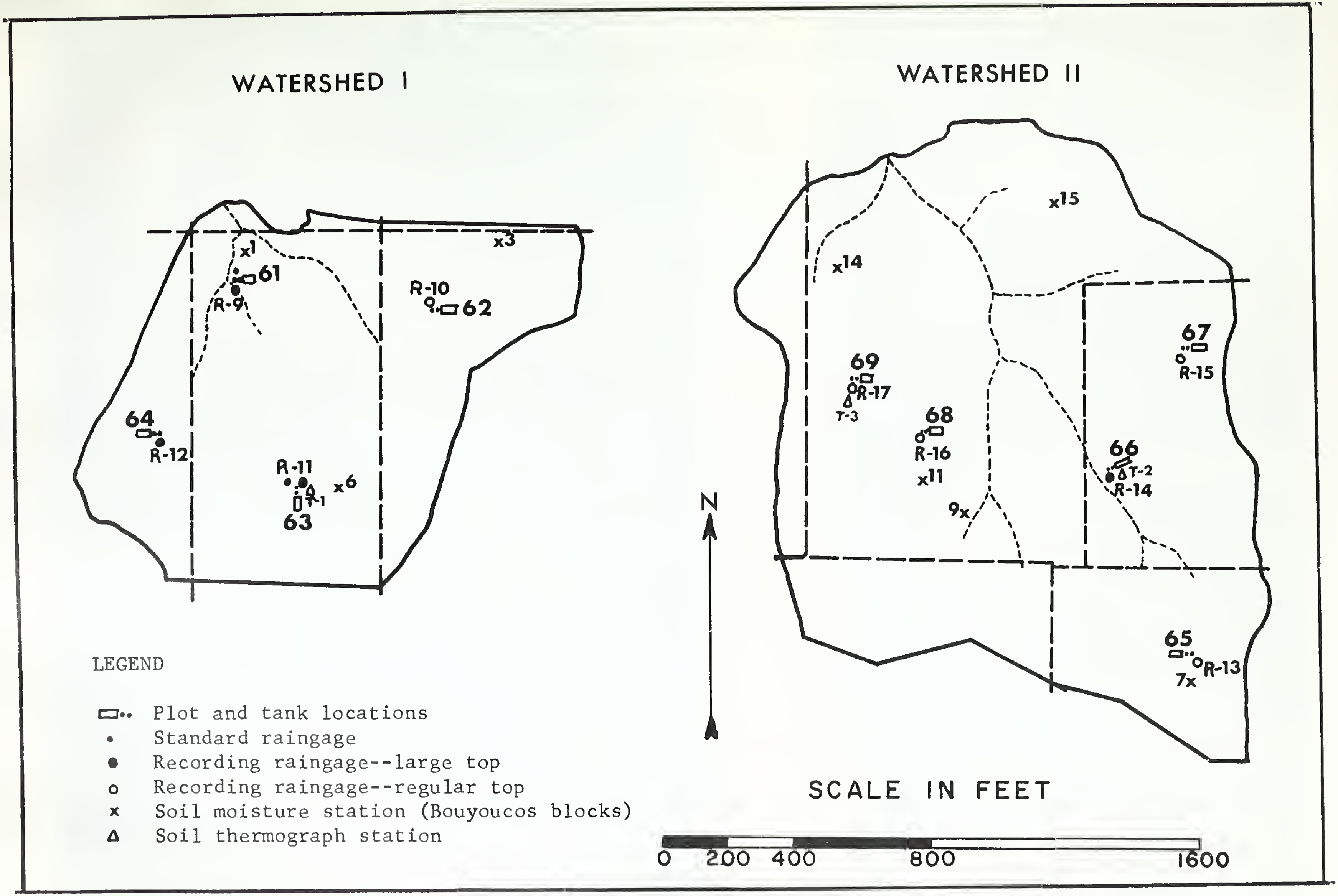


Figure 18.--Locations of natural rainfall plots on watersheds I and II, Edwardsville, Ill.

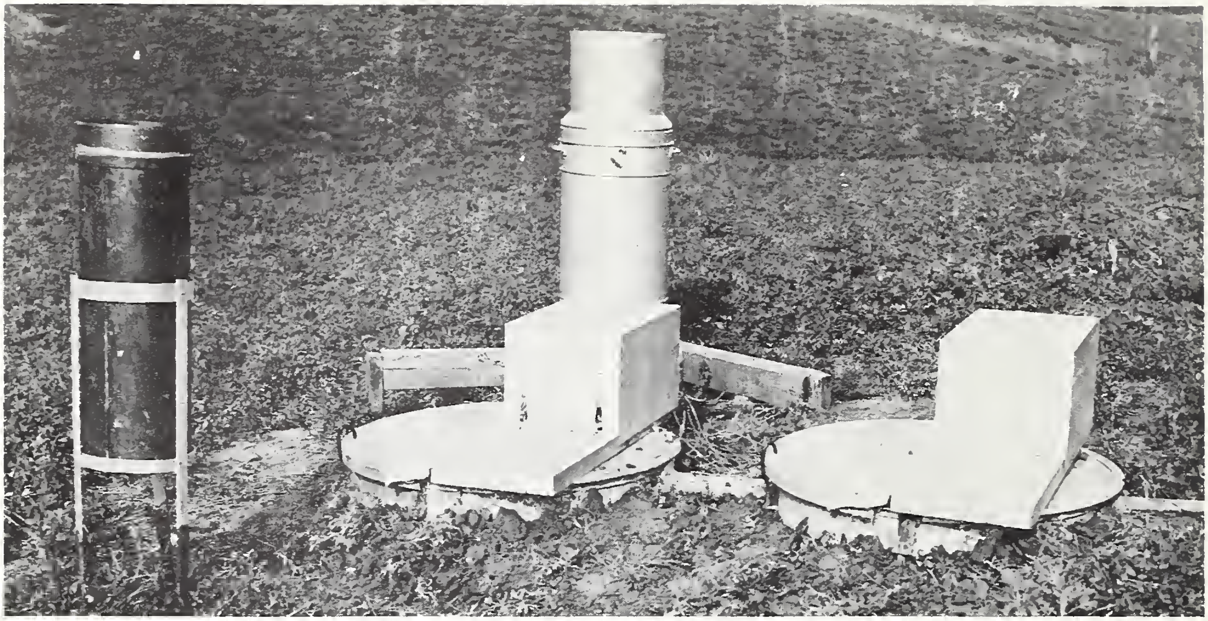


Figure 19.--Apparatus for measuring rainfall and runoff on natural rainfall plots.

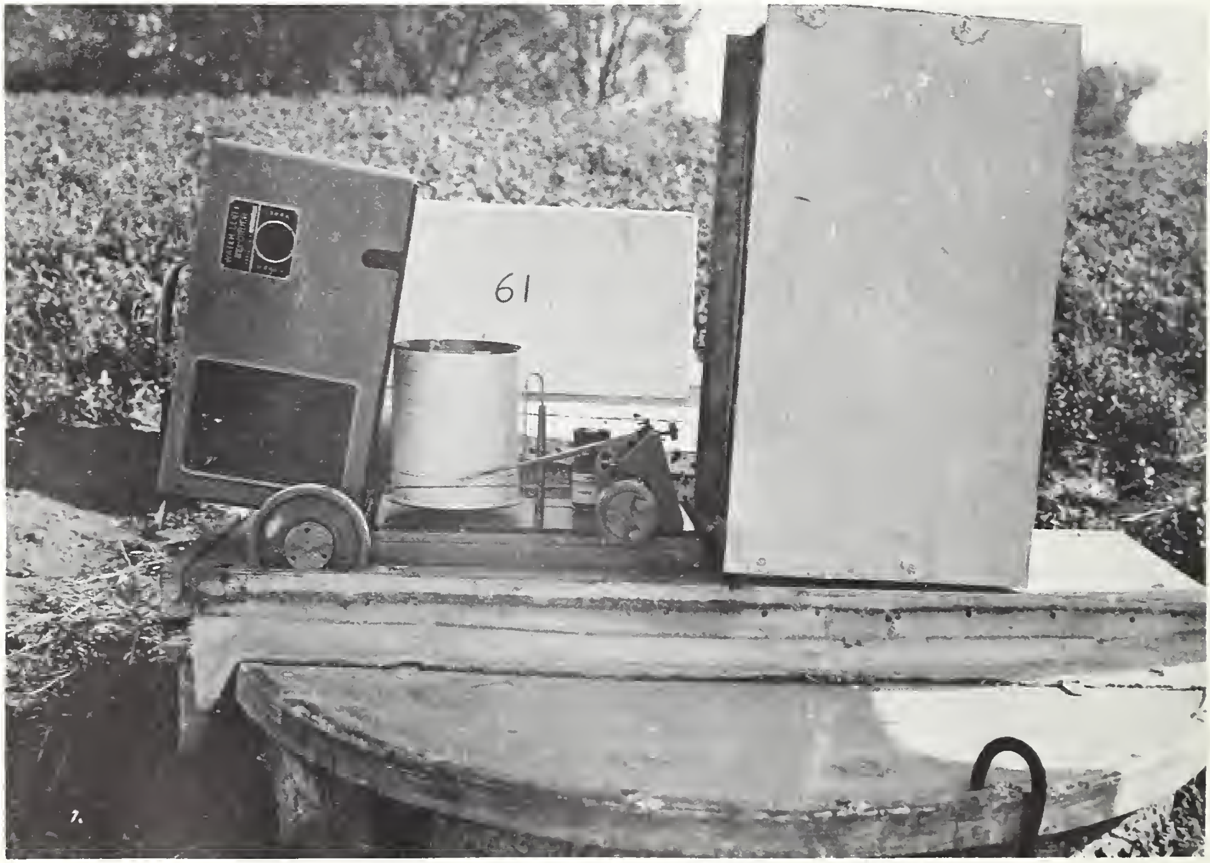


Figure 20.--Runoff tank with recorder.

of the plot area, thus each tank will hold 3 inches of surface runoff. The smallest discernible increment of runoff from the plot is therefore 0.12/15 = 0.008 inch. Hook gages were constructed for reading the water surface to the closest 0.001-foot elevation.

The stage recorder was mounted on the tank top so as not to exceed the elevation of the plot by more than half its distance from the plot. Thus any effect upon natural rainfall distribution was avoided. The float counterweight had to be carried outside the tank to an empty, watertight well in which it could rise or descend without immersion. Idler brackets were used for this purpose, and their general assembly is illustrated in figure 21. The counterweight idler wheel illustrated is the 12-inch circumference wheel removed from the original FW-1 recorder.

Thermographs used were the vertical drum type with three pens and three antennas.

Soil moisture was estimated from periodic readings taken with the Wheatstone Bridge, which measures electrical resistance in plaster of Paris blocks buried in the soil profile.

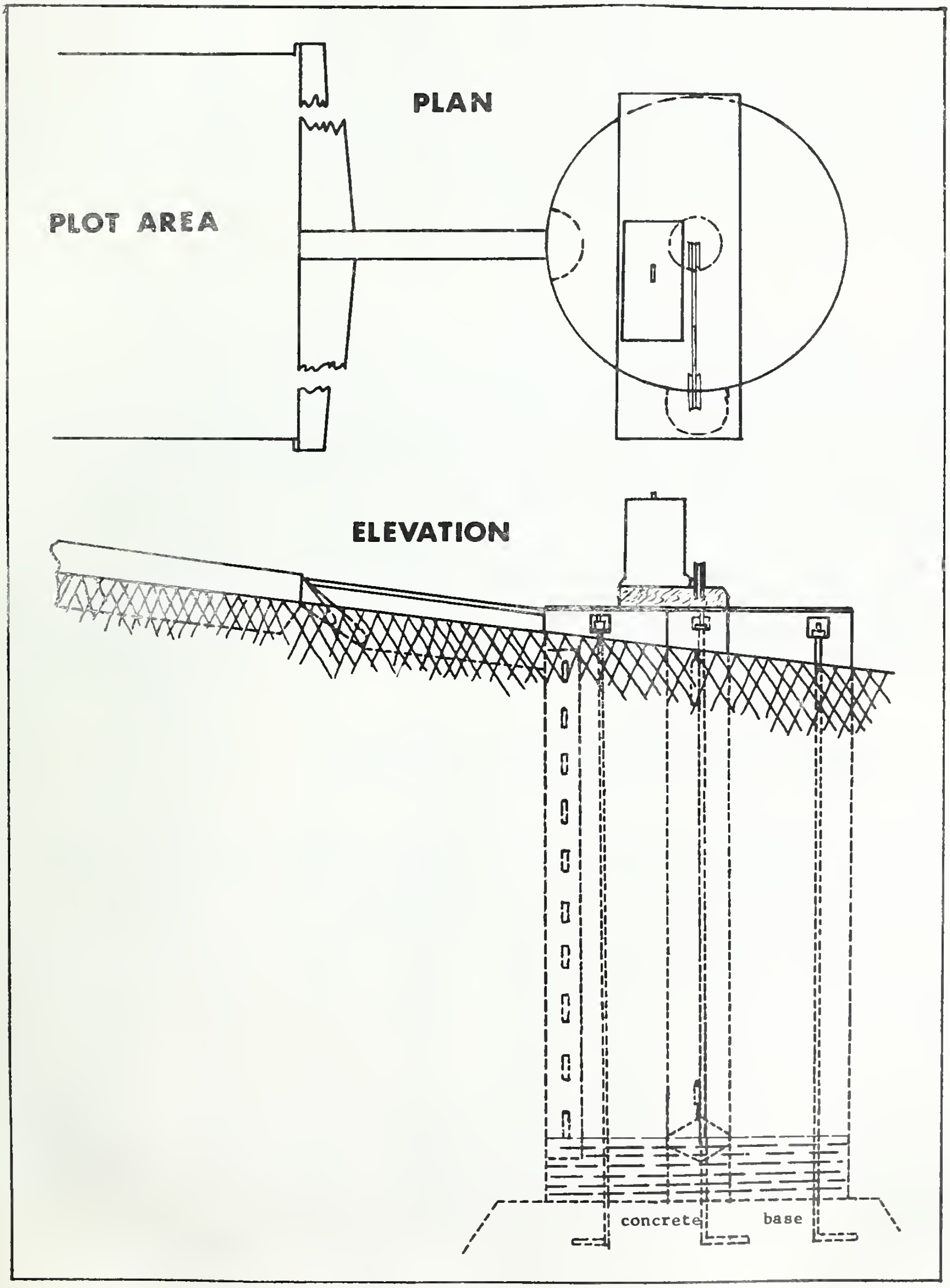


Figure 21.—Catchment tank and measuring recorder; plan and elevation shown in relation to plot area.

Procedures Used in Rainfall-Runoff Studies

Field Notes

Each recorder of rainfall, runoff, and soil temperature was visited twice each week for inspection. Charts were changed at least once each week for all stations. In the event of rainfall that produced runoff, rain gage and runoff recorder charts were changed as soon thereafter as possible. If a rain did not produce runoff, only rain gage charts were changed.

Field notes kept for each rain gage chart provided the date and time (watch and pen time) of placement and removal, amount in recording gage bucket, and amount in accompanying standard Weather Bureau gage.

Runoff recorder chart notes included date and time (watch and pen time), chart line or pen reading, hook gage reading, and pen reversals (upper and lower) for both placement and removal. Time of start of runoff was noted if inspection was made during the storm.

Descriptions of vegetative cover on each plot were supplemented by counts of canopy and basal area of plants obtained with the frame and ten vertical tines of the apparatus used in the Iowa Method of obtaining pasture data. Counts and descriptions are given in tables 32 and 33 of the appendix. Vegetation records were compiled whenever discernible or suspected changes occurred from droughts, rainy periods, or seasonal changes.

Data Processing

All charts were annotated as soon as possible after removal from the recorder. Tabulations of rainfall and plot runoff are presented in appendix tables 12 to 20 and 21 to 29, respectively.

From the rainfall records, break points in the pen traces were tabulated and rates were computed. Rainfall tabulations were corrected proportionally to agree with the recording bucket total as measured in the standard gage tube. Since rain gages 9, 11, and 14 were equipped with the double-area tops to double the pen traverse for any given increment of rainfall, these gages provided a more sensitive and discernible record than the other gages. They were located at plots 61, 63, and 66, respectively (fig. 18). If a small-top gage recorded a total rainfall equal to the total of the nearest large-top gage, it was not tabulated, but reference was made to the large-top gage for use with the corresponding plot runoff record.

Results of Rainfall-Runoff Studies

Characteristics of rainfall and the response of different soils under various vegetative densities are so varied that no uniform relationship may be expected between amounts of rainfall and amounts of runoff. For instance, a rainstorm of 3 inches falling in 12 hours might cause no runoff, whereas 3 inches falling in 2 hours would probably cause high amounts of runoff. The wide variation in runoff that actually occurred on watershed I is well illustrated by plotting rainfall versus runoff (fig. 22). The wide scatter of points indicates a lack of consistency in the rainfall-runoff relationship and indicates the hazards of attempting to predict runoff on the basis of rainfall alone.

Storm runoffs computed by weighting plot runoffs on isopotal areas (table 5 and fig. 23) agree quite well with observed watershed runoffs. The watershed runoff computed by averaging plot runoffs for most storms on watershed I was greater than the actual measured runoff, although the difference was small. On watershed II runoff from the watershed was generally higher than that computed from the plots in the watershed. Trickle flow observed on watershed II may account for this difference.

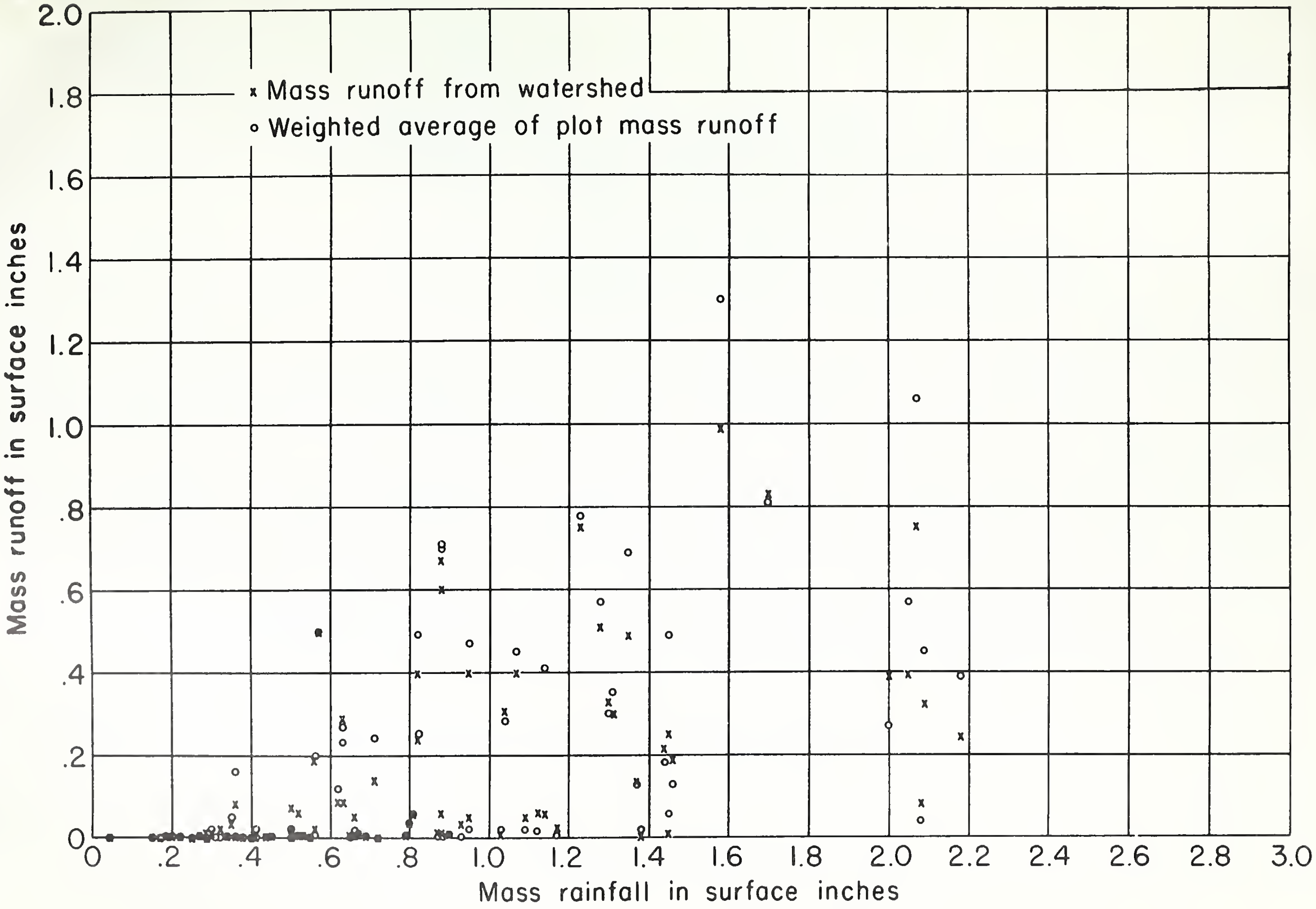


Figure 22.--Plot and watershed runoff versus rainfall, showing wide scatter of points and lack of relationship pattern on watershed I.

TABLE 5.--Rainfall and runoff from plots and watershed I, Edwardsville, Ill.

Date of storm	Amount of runoff				Weighted average of plots[1]	Total runoff from watershed I
	Plot 61	Plot 62	Plot 63	Plot 64		
1941	In.	In.	In.	In.	In.	In.
July 9	0.46	0.06	0.11	0.25	0.17	0.06
10	.80	.42	.33	.62	.49	.25
Aug. 24	.09	---	.05	.20	.06	.01
Sept. 2	1.20	.29	.45	.93	.57	.39
24-25	.13	---	---	.02	.02	---
Oct. 5	.10	---	[2] T	.01	.02	---
7	.01	---	T	T	T	---
9	.30	.01	.02	.10	.06	.06
14	.11	---	.01	.03	.02	.01
17-18	.60	.04	.10	.12	.13	.19
21	.09	---	T	.01	T	.02
22-23	.96	.12	.35	.26	.30	.33
26	.02	---	---	---	T	---
30-31	.81	.08	.09	.55	.27	.39
Nov. 5- 6	.83	1.23	.78	1.11	1.06	.75
22-26	.03	---	---	---	T	---
Dec. 22-23	---	---	---	---	---	T
25-26	---	---	---	---	---	T
1942						
Jan. 30-31	T	---	---	---	---	---
Feb. 4- 5	.03	.22	.20	.29	.20	.19
5- 7	.10	.81	.74	.82	.71	.60
9-12	---	---	---	---	---	T
16-17	---	.48	.01	.01	.23	.09
27	---	.02	.01	T	T	.02
Feb. 28 &						
Mar. 1	---	.02	---	.01	.01	.01
2	---	.02	.01	---	.01	T
7- 8	---	.50	.01	.02	.24	.14
12-13	.01	.22	.01	.06	.12	.09
Apr. 7	T	.01	---	---	T	.02
8-10	.01	.88	.01	.15	.45	.32
May 3	.02	T	---	---	.02	.01
5- 6	.06	.02	.01	.03	.02	.05
13	.03	.01	---	---	T	T
15	.04	T	---	.01	T	.03
17-18	.01	---	---	T	T	.01
June 1	.01	T	---	---	T	T
13	.34	.13	.05	.08	.13	.14
18	---	---	---	---	---	T
20-21	.52	.37	---	.52	.35	.30
21(p.m.)	.05	---	.25	---	.05	.03
26	.82	.77	.67	1.02	.81	.83
July 7- 8	.10	---	.01	.03	.02	.05
8- 9	2.31	2.66	2.98	2.43	2.63	2.63
9-10	0.58	0.75	0.66	0.67	0.70	0.67

TABLE 5.--Continued

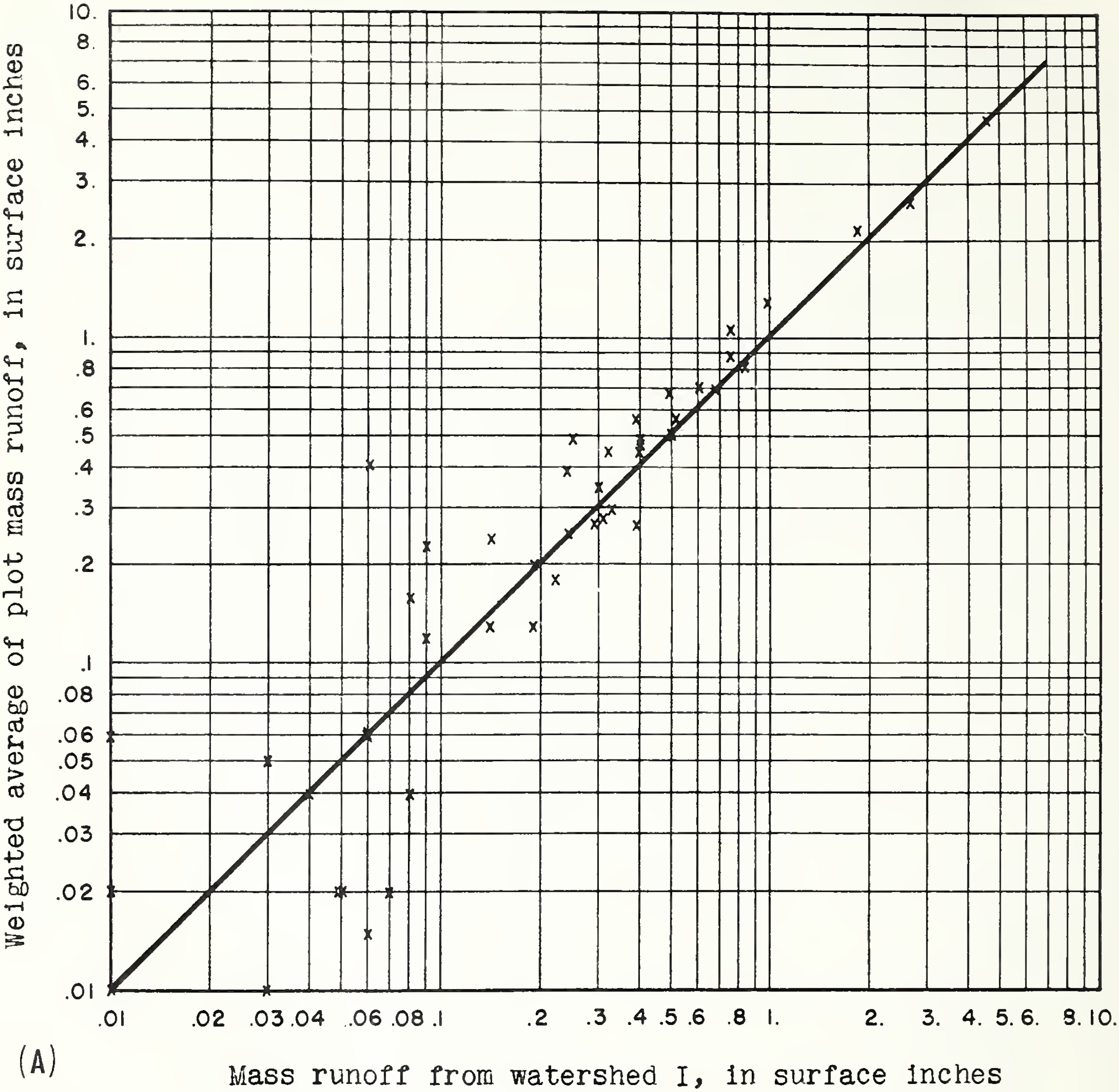
Date of storm	Amount of runoff				Weighted average of plots[1]	Total runoff from watershed I
	Plot 61	Plot 62	Plot 63	Plot 64		
1942	In.	In.	In.	In.	In.	In.
July 12	.04	.01	.03	.03	.02	.07
14	.02	---	.01	.01	T	.06
21	.03	.01	---	---	T	.02
Aug. 6	.24	.13	.21	.22	.18	.22
7	.43	.21	.25	.22	.25	.24
15	---	---	---	---	---	T
Sept. 8	---	---	---	---	---	T
Oct. 29-30	.25	.01	---	.02	.04	.08
Nov. 4- 5	.11	---	.01	---	.015	.06
17(a.m.)	.01	---	---	---	T	---
17-18	.52	.22	.14	.39	.28	.31
21	.10	.01	---	.02	.02	.05
21-23	.54	.84	.12	.40	.57	.51
Dec. 10	---	---	.01	---	T	T
22-24	.02	---	.05	---	.01	.03
26-28	1.18	2.31	2.38	2.12	2.15	1.84
1943						
Jan. 14	---	---	---	---	---	T
26	---	---	---	---	---	T
Feb. 3	.27	.07	.54	.49	.27	.29
5	---	.02	---	---	---	T
Mar. 10	---	---	---	---	---	.01
15-16	.10	.75	.78	.83	.69	.49
18-19	.19	.50	.51	.64	.49	.40
May 7	.16	.64	.17	.18	.39	.24
8	.01	.22	.24	.04	.16	.08
9-12	.38	1.21	[3] 1.21	1.26	1.30	.99
14-16	.13	.40	.77	.47	.45	.40
16-18	4.37	4.81	[3] 4.81	4.67	4.72	4.49
19-21	.15	.50	[3] .50	.45	.50	.50
24	---	---	---	---	---	T
June 5	---	---	T	T	T	.01
6- 7	.58	.92	.88	.50	.78	[3] .75
10	.27	.48	.62	.41	.47	.40
15-16	.03	.04	.09	.02	.04	.04
20	T	---	---	---	T	T
26	---	---	---	---	---	T

---

[1] Average weighted by percentage of watershed area represented by each plot, that is, plot 61 = 12.06%, plot 62 = 47.32%, plot 63 = 19.63%, and plot 64 = 20.99%.

[2] T = trace of runoff.

[3] Estimated value.


10.
8.
6.
5.
4.
3.
2.
1.
.8
.6
.5
.4
.3
.2
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.08
.06
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.02
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.1
.2
.3
.4
.5
.6
.8
1.
2.
3.
4.
5.
6.
8.
10.
Weighted average of plot mass runoff, in surface inches
(A)
Mass runoff from watershed I, in surface inches

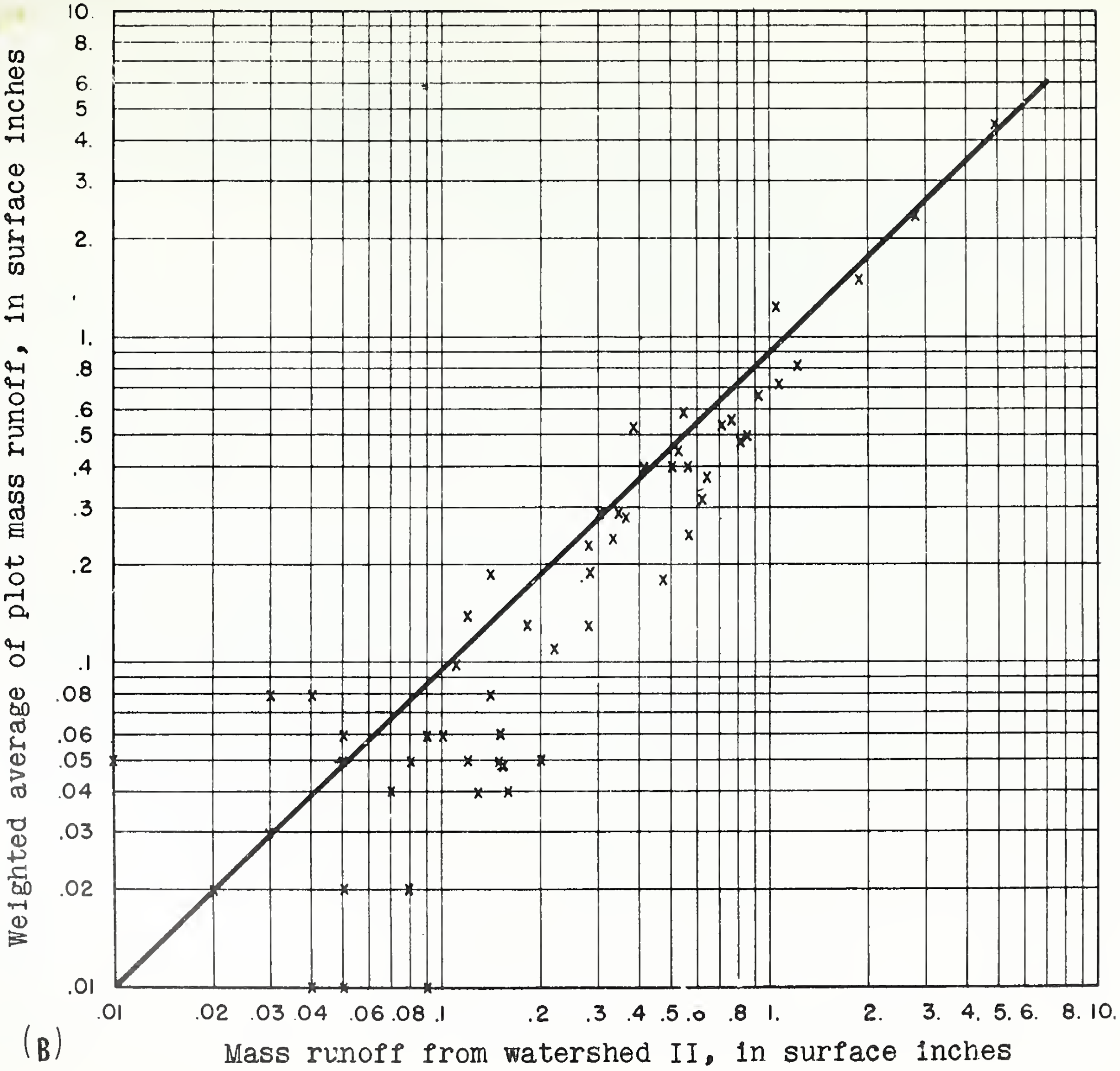
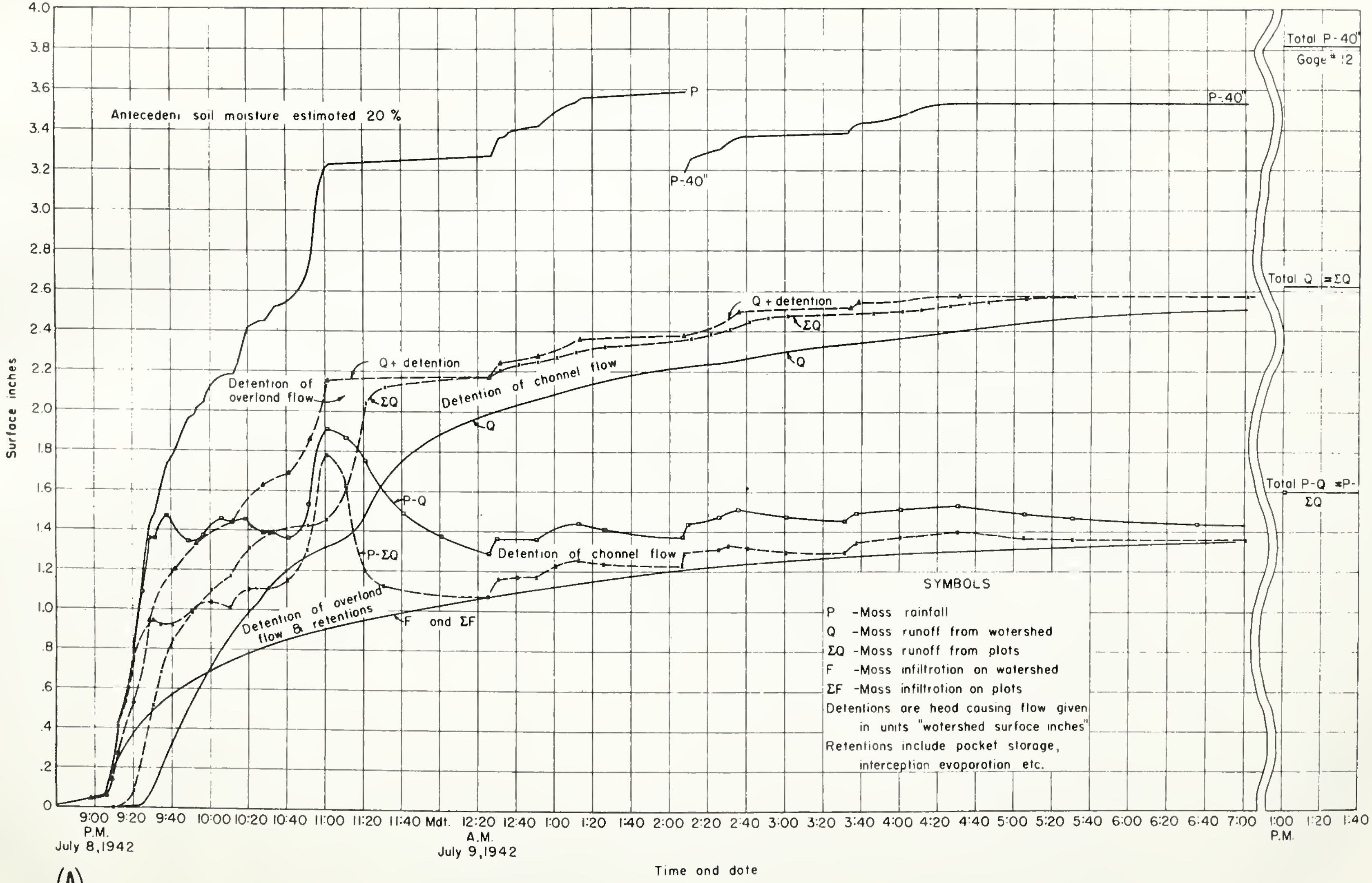


Figure 23.--Relationship between weighted average of plot runoff and measured runoff from (A) watershed I and (B) watershed II.


Antecedent soil moisture estimated 20 %
Surface inches
4.0
3.8
3.6
3.4
3.2
3.0
2.8
2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
.8
.6
.4
.2
0
9:00 P.M. July 8,1942
9:20
9:40
10:00
10:20
10:40
11:00
11:20
11:40
Mdt.
12:20 A.M. July 9,1942
12:40
1:00
1:20
1:40
2:00
2:20
2:40
3:00
3:20
3:40
4:00
4:20
4:40
5:00
5:20
5:40
6:00
6:20
6:40
7:00
1:00 P.M.
1:20
1:40
Time and date
P
P-40"
P-40"
Total P-40" Gage # 12
Total Q = ΣQ
Total P-Q = P-ΣQ
Q + detention
Q + detention
ΣQ
ΣQ
Q
Q
Detention of overland flow
Detention of channel flow
Detention of channel flow
P-Q
P-ΣQ
Detention of overland flow & retentions
F and ΣF
SYMBOLS
P -Mass rainfall
Q -Mass runoff from watershed
ΣQ -Mass runoff from plots
F -Mass infiltration on watershed
ΣF -Mass infiltration on plots
Detentions are head causing flow given in units "watershed surface inches"
Retentions include pocket storage, interception evaporation etc.

(A)

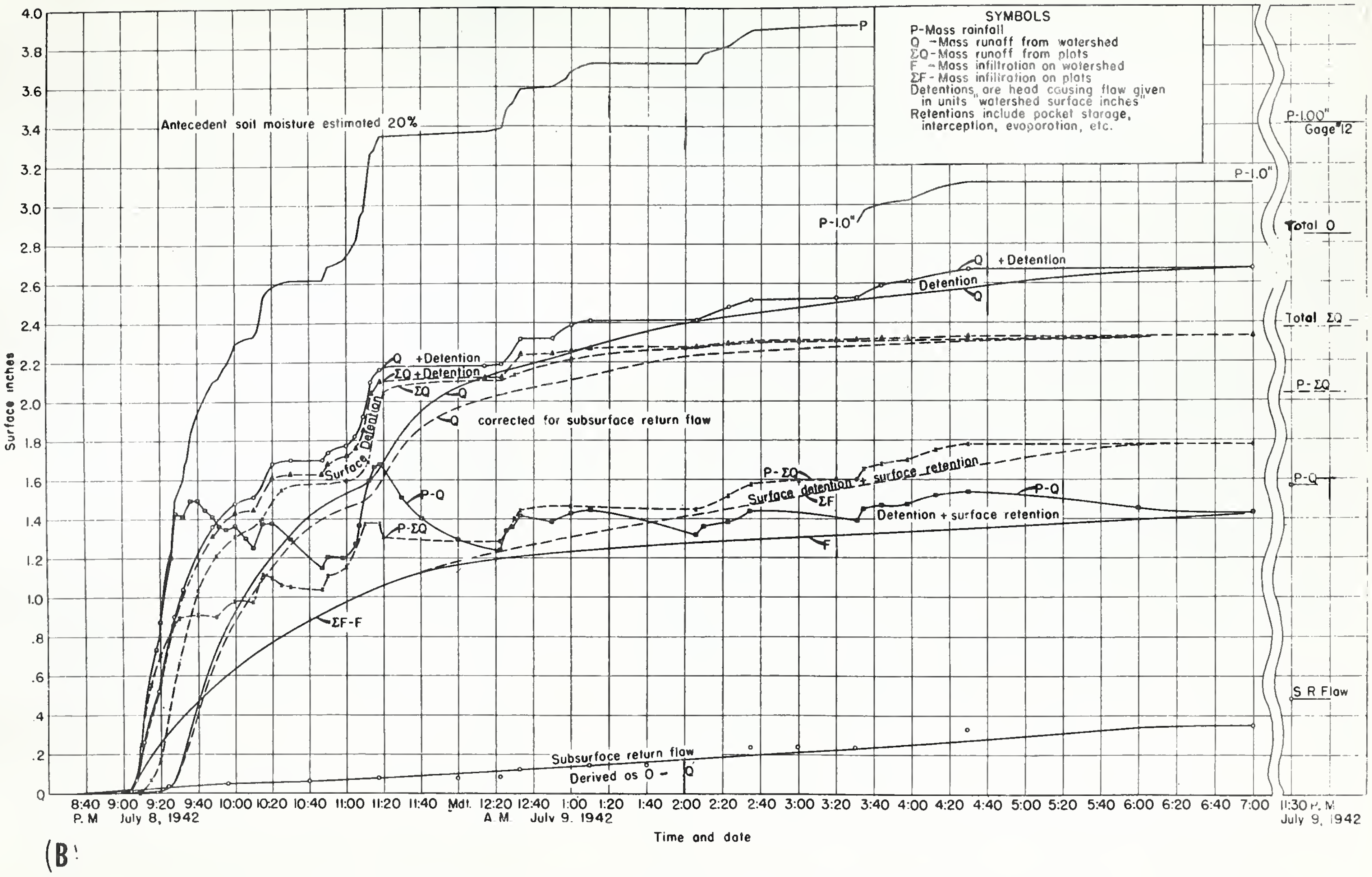


Figure 24.--Rainfall, runoff, and infiltration as indicated by plot averages and by watershed measurements for the storm of July 8 and 9, 1942: (A) watershed I; and (B) watershed II.

The Edwardsville data show reasonably good agreement in total runoff between the plots and the watershed; however, the rate of runoff from a watershed during a storm does not increase or decrease simultaneously with rainfall since some water is retarded in its movement to the outlet. The runoff from small plots changes more quickly than watershed runoff with changes in rain intensity (fig. 24a and b). This change produces a lag between plot and watershed runoff. Figure 24a and b shows two hydrographs of a storm occurring on watersheds I and II. In brief, these graphs illustrate the relationship of the hydrographs from small 6- by 12-foot rectangular plots lying within the watershed to the hydrograph of the entire watershed as a unit.

Each small plot provides a hydrograph of flow representative of flow from each 6- by 12-foot area within its respective isopotal area. Due to the size of these plots, flow from them has been considered as overland flow. This, then, for a given storm may be presumed to be a measure of the quantity of water available to watershed outflow. The overland flow from isopotal areas was therefore expressed in watershed surface inches. The proportion of the isopotal area to the watershed area was directly applied in this conversion. A summation of these overland flow hydrographs from the isopotal areas in watershed surface inches is essentially similar to the overland flow hydrograph of the watershed (labeled ΣQ in fig. 24a and b).

A check of this derived hydrograph of overland flow is provided by analysis of the observed watershed hydrograph. A curve of excess rainfall ($Q +$ detention in fig. 24a and b) was obtained by using time condensation[5] in the analysis of the observed hydrograph of watershed runoff. This curve represents the water in excess of infiltration and other retentions which at any given time is free to run off and eventually does. Excess rainfall differs from observed runoff at any given time by the amount of water needed to provide head for flows. The summation curve of overland flow (plot runoff) should be somewhere between the excess rainfall curve ($Q +$ detention) derived by hydrograph analysis and the observed runoff curve. Examination of figure 24a and b indicates the conformity of the ΣQ curve to this concept. The departure from this pattern of the curves on figure 24b is undoubtedly due to return flow seepage on watershed II. A very reasonable estimate of return flow seepage, as indicated on the graph, virtually eliminates this discrepancy when deducted from the observed flow.

CONCLUSIONS

Storm totals alone are not sufficient guides for the determination of runoff from small watersheds. In addition we need: (1) rainfall intensities and areal distributions for different parts of a watershed, (2) infiltration capacities of the various watershed segments, including a knowledge of how soil depth, soil moisture, vegetative cover, land use, and seasonal changes in physical conditions affect infiltration, and (3) enough basic information to permit routing the excess precipitation from the different segments of the watershed to its outlet.

Information on the size, configuration, and amount of vegetative cover of the watershed, and the general nature of the soil, is usually available. Other needed information, not so readily available, includes data on soil permeability and curves of infiltration rates.

The studies reported here suggest how the information needed for good hydraulic and hydrologic design on agricultural and other lands may be obtained and applied. They show that rainfall and infiltration data needed to determine watershed runoff can be obtained more satisfactorily by dividing a watershed into segments rather than by treating a watershed as one unit. In this way, variations in infiltration capacity can be considered and a more reliable result obtained.

On the Edwardsville watersheds, rainfall (minus infiltration) and depression storage, summed and weighted for the isopotal areas, was fairly indicative of the amount of runoff from the encompassing watersheds. However, this quantity of water is subject to temporary storage on land surfaces and in the drainageways of these watersheds. Also the amount of excess rainfall on the various isopotal areas may be altered by additional channel infiltration or return flow. Therefore, a simple subtraction of infiltration from rainfall would not give precisely the quantities or peak rates of discharge that were recorded for the watershed.

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[5] Holtan, H. N. Time Condensation in Hydrograph Analysis. Trans. Amer. Geophys. Union. 1945.

However, proper allowances should be made for surface detention, channel storage, and return flow in routing of flood flows to the watershed outlet to provide the basis for a better estimate of the watershed hydrograph. This is particularly true of the larger storms. For small storms the amount of water lost en route is a relatively much greater part of the entire flow. These and similar discrepancies prevented a close agreement between computed and observed runoffs for small storms.

The brief studies reported here point to the usefulness of specific information on the infiltration characteristics of a watershed. If information is given on the storm pattern, the infiltration characteristics of different portions of a watershed, and the drainage pattern, it is apparent that the hydrograph corresponding to specific storms may be computed with a fair degree of accuracy.

APPENDIX

In view of the limited analyses presented in the body of the report, these data are included in this appendix for the benefit of those who may desire to perform further analyses. The infiltrometer data were obtained from May 1940 through July 1941, and the data from the natural rainfall-runoff studies on watersheds I and II were obtained from July 1941 through June 1943.

The general content of this appendix is as follows:

Infiltrometer survey:

Tables 6 to 8 -- Supplementary data for infiltrometer runs.
Tables 9 to 11 -- Vegetative cover and soil profile descriptions for all plots tested.

Rainfall-runoff studies:

Tables 12 to 20 -- Rainfall tabulations for the entire period of observations.
Tables 21 to 31 -- Runoff tabulations for all nine plots for the entire period of observations.
Tables 32 and 33 -- Supplementary data for the nine plots observed.

Infiltrometer Data Tabulations

Appendix tables 6, 7, and 8 were prepared from information and data obtained with a type "F" infiltrometer operated on the Love farm, Edwardsville, Ill., during the period May 1940 through December 1941.

Plots 1 to 16 were used throughout the period. They were located to provide good coverage of both the diverse moisture conditions and the geography of the areas (fig. 2) and were visited at intervals during the period. Plots 17 to 53 were located at random and were run only once.

For all analyses involving plots 1 to 53 it is suggested that the data be used from runs made on plots 1 to 16 during the period August 26, 1940, through February 4, 1941, or the period June 2, 1941, through July 24, 1941.

The test runs consisted of an initial run followed by a wet run the next day. Analytical storms were run after the wet run to provide information for the analyses of the hydrographs. For some wet antecedent moisture conditions the second run was omitted.

Vegetative Cover on Infiltrometer Plots

Vegetative cover conditions were described for each run on each plot with the aid of the frame and 10 vertical tines commonly used in the Iowa Method of obtaining pasture data (fig. 4). Generally, the type, condition, size, and density of vegetative cover were noted.

Comparative numerical evaluations of cover were needed to better portray the relationship between vegetative cover and infiltration. On March 25, 1941, visual estimates were made of the basal area of plants in percentage of plot area (table 9) for runs made prior to that date. These values are used as indices of the relative extents of perforation of the soil surface by plants on the various plots. Basal area of vegetation on runs made after March 25 (table 10) was evaluated by an adaptation of the Iowa Method at the time of the run, and estimates of this area are included in the descriptions. The intercept of each tine at the ground surface was counted as bare soil or root crown and the percentage computed. Basal areas determined by the modified Iowa Method correlated very closely with simultaneous visual estimates.

Soil Profile Descriptions

The primary purpose of appending soil profile descriptions to the infiltrometer survey data is to provide individual characterizations of the soil profiles of each plot. These descriptions by the State Soil Scientist of the Soil Conservation Service (plots 1 to 38) and by the authors (plots 39 to 53) are basic data coordinated with the determinations shown on table 6 and include only the characteristics directly related to the study. The first part of this section contains general series descriptions of the soils on these plots; the second part is a tabular summary of profile descriptions made on each individual plot.

Deep Loess Timber Soils

Bogota silt loam.--Bogota silt loam occupies undulating topography. The subsurface is mottled yellow and gray silt, and the subsoil is a yellowish heavy clay loam mottled with gray. Bogota silt loam is slowly permeable. The areas of this type are adapted to general crops and have been farmed heavily to corn and small grain crops. This has resulted in a surface soil which packs readily and is not very absorptive. While this type does not occur on very steep slopes, it was a very erosible soil at the time of these observations. This was caused in part by the packing of the soil particles by heavy rain and in part by the heavy subsoil which impedes percolation.

Alma silt loam.--Alma silt loam is usually found on slopes of 3 to 8 percent. The surface 4 to 5 inches is a dark yellow gray where present. On most cultivated fields all of the dark surface has been removed by erosion. The subsurface which extends to 14 or 16 inches is a light-yellow silt loam. The subsoil is a silty clay loam, slightly compact and slightly plastic, but permeable to water. The color is usually reddish yellow, and the thickness of the heavy subsoil layer is about 10 to 14 inches. This type erodes very easily because of its topography and the flourlike surface and subsurface soils. Practically all of the cultivated slopes of this type have lost half or more of the surface and subsurface soil, and on slopes of 5 percent or more silty clay subsoil is commonly exposed over the entire slope.

Elco silt loam.--Elco silt loam is found on moderately to strongly rolling topography. In the test area there is a good deal of variation caused by different depths of loess. In the southern part of the area, the loess, or silty material, is thick enough so that even on the lower part of the slopes the underlying weathered Illinoisan till is not exposed. In the northern part, the lower half of the slopes is usually a mixture of silty material with a yellowish-red gravelly clay drift. The soil on the upper part of the slope may be described as follows: The surface 4 inches in undisturbed timber is a dark yellowish gray; the subsurface to a depth of 9 to 10 inches is a reddish-yellow friable silt loam. On cultivated areas, both surface horizons are usually missing and the reddish silty clay loam subsoil is exposed. The amount of clay in this horizon is not enough to make it very objectionable as a surface soil if worked correctly. However, the soil is very deficient in organic matter, and the first requirement in making this type less erodible and more productive is to incorporate plenty of active organic matter. This type as mapped occurs on topography too steep for cultivated crops and is subject to serious and even destructive erosion if not handled correctly. Productivity depends largely on the thickness of the loess or silty material.

Hickory gravelly loam.--Hickory gravelly loam (glacial "C" horizon of table 6) is found on steep slopes in the northern part of the area. It has not undergone true soil development as erosion has removed the material about as fast or faster than it has formed. The type is quite variable. It has formed from the Illinoisan till which has weathered so that calcareous till is probably not within reach of the root systems of ordinary cultivated crops or grasses. This till is a mixture of silt, coarse gravel, and clay in varying amounts. This soil erodes rapidly where cultivated because of the steep slopes and poor vegetative growth.

Rainfall-Runoff Tabulations

Rain gages 9, 10, 11, and 12 were installed July 1, 1941, at locations chosen to provide a basis for determination of the storm center and its traverse over the two watersheds. Rain gages 9 and 10 were placed on watershed I and rain gages 11 and 12 were placed on watershed II.

On July 15, 1941, rain gages 9 and 10 were moved to plots 62 and 64, respectively, to obtain better geographic coverage of prevailing storm paths on watershed I. As the need for more gages became evident, rain gages 9 through 17 were moved or installed near plots 61 through 69, respectively, on September 4, 1941. Standard Weather Bureau gages were placed beside rain gages 9, 11, 13, and 15 as checks on total rainfall recorded.

On September 29, 1941, large funnels (double area) were placed on rain gages 9, 11, and 14 to magnify the scale of the rainfall record. The standard gages were moved to rain gages 9, 11, 14, and 17.

Recording gages were installed as they arrived from the factory but were not calibrated until October 8, 1941. If discrepancies occurred between the total pen record and the amount of water in the bucket (measured in a standard gage tube), pen traces were corrected proportionally.

All storms were tabulated for rain gage 11 as a reference for total annual rainfall on the watershed. On all other gages, records were tabulated only in the event of runoff at the corresponding plot. If the total rainfall intercepted by one of these gages equaled the total rainfall intercepted by one of the large-top gages (rain gages 9, 11, and 14), no tabulations were made, but reference was made to the pertinent large-top recorder gage. Occasionally a record was lost or rendered unintelligible due to mechanical failure of the gage; in those cases, reference was made to another gage having the same total interception in the recorder bucket.

TABLE 6.--Supplementary data for plots used in type "F" infiltrometer runs on watersheds I and II at Edwardsville, Ill., for period May 7, 1940 to July 24, 1941

Plot No. and run[1]	Date of run	Land use	Slope	Soil type	Applied rainfall		Top soil depth	Antecedent moisture at--			Volume wt. of soil		Average temperatures			
					Rate	Duration		0-7 inches	7-14 inches	14-21 inches	0-6 inches	Subsoil	Runoff	Soil	Air	Water supply
	1940		Pct.		In./hr.	Minutes	In.	Pct.	Pct.	Pct.			°F.	°F.	°F.	°F.
7 I	May 7	Pasture	1.36	Bogota silt loam	2.06	80	18	27.6	26.4	23.9	---	---	71	66	83	70
W	8	--do---			1.80	37		27.3	28.7	25.4			68	64	81	67
8 I	9	Pasture	1.30	Bogota silt loam	2.03	74	17	25.6	23.3	23.2	---	---	63	64	71	65
W	10	--do---			1.94	21		26.4	25.8	24.4			60	59	69	60
		--do---			2.13	37										
2 I	16	Alfalfa	9.62	Alma silt loam	2.00	104	7	18.6	20.6	22.2	---	---	59	59	65	60
W	17	--do---			1.97	40		25.4	22.2	21.4			57	56	63	56
1 I	17	Alfalfa	11.72	Alma silt loam	1.50	25	4	19.6	21.1	20.6	---	---	58	59	56	58
		--do---			1.82	20										
W	18	--do---		---do----	1.68	30		26.8	22.0	21.6			60	59	69	60
2W	20	--do---		---do---	3.42	29		24.9	23.2	20.6			64	66	75	63
5 I	21	Alfalfa	1.22	Bogota silt loam	1.71	77.5	15	21.3	21.5	22.8	---	---	66	70	75	64
W	22	--do---			1.80	52		24.3	24.5	24.4			63	64	73	60
6 I	22	Alfalfa	1.00	Bogota silt loam	1.60	76	14	19.7	19.2	22.2	---	---	62	68	69	58
W	23	--do---			1.78	46		26.8	23.4	25.5			61	61	67	58
9 I	23	Virgin pasture	8.27	Alma silt loam	1.73	78	12	23.3	21.5	22.8	---	---	63	65	64	59
W	24				1.78	48		25.4	24.2	23.3			63	62	67	60
10A I	24	Virgin pasture	8.50	Alma silt loam	1.57	117	13	28.2	23.3	24.4	---	---	62	65	63	59
W	25				1.56	58		29.0	25.5	26.2			59	62	61	57
13 I	27	Virgin pasture	15.25	Elco silt loam	1.75	133	10	23.8	22.2	23.2	---	---	62	64	70	60
W	28				1.77	68		26.2	25.9	25.4			59	60	65	57
14 I	28	Virgin pasture	16.83	Elco silt loam	1.83	50	8	17.2	22.9	23.1	---	---	61	65	66	56
W	29				1.78	73		28.0	24.4	23.5			57	60	60	55
15 I	June 3	Pasture	12.11	Elco silt loam	1.68	112	2	10.4	20.6	24.0	1.498	---	68	72	78	68
W	4	--do---			1.75	44		24.4	24.8	25.7			68	69	78	66
16 I	4	Pasture	11.11	Elco silt loam	1.54	118	3	13.4	21.8	21.9	1.447	1.530	60	73	72	58
W	5	--do---			1.50	52		28.9	27.9	27.3			64	69	78	60
12 I	5	Virgin pasture	1.67	Bogota silt loam	1.78	197	20	19.3	19.9	19.5	1.457	[3] 1.417	65	75	75	62
W	6				1.84	37		20.2	26.9	26.0			65	71	78	62
11 I	6	Virgin pasture	1.25	Bogota silt loam	1.80	[4] 228	16	17.2	18.1	19.1	1.467	---	68	75	81	61
W	7				1.79	55		30.6	28.7	27.5			69	74	71	64
1 I	17	Alfalfa	11.72	Alma silt loam	1.61	153	4	17.2	19.3	16.5	1.526	1.514	66	76	69	69
W	18	--do---			1.64	70		23.3	27.4	21.0			65	76	77	64
2 I	18	Alfalfa	9.62	Alma silt loam	1.62	146	[2] 7	13.6	16.5	19.0	1.438	1.454	65	76	65	65
W	19	--do---			1.63	98		25.1	22.4	20.0			61	72	69	55
5 I	19	Alfalfa	1.22	Bogota silt loam	1.79	123	15	10.8	11.7	17.1	1.488	[3] 1.608	61	73	68	58
W	20	--do---			1.62	63		25.7	22.4	20.6			56	63	61	55
6 I	20	Alfalfa	1.00	Bogota silt loam	1.81	125	14	11.9	12.8	20.2	1.460	[3] 1.474	58	69	64	58
W	21	--do---			1.84	120		26.0	23.9	23.6			55	64	63	52
7 I	25	Pasture	1.36	Bogota silt loam	1.80	140	18	5.8	15.1	14.7	1.580	[3] 1.473	60	68	71	66
W	26	--do---			1.80	66		22.9	21.1	17.4			60	68	72	57
8 I	26	Pasture	1.30	Bogota silt loam	1.78	140	17	5.9	7.9	18.4	1.588	[3] 1.475	67	80	77	59
W	27	--do---			1.78	66		22.3	19.1	20.1			64	74	77	61
9 I	27	Virgin pasture	8.27	Alma silt loam	1.81	165	12	6.6	8.2	13.4	1.430	[3] 1.452	63	79	67	59
W	28				1.80	90		25.5	16.9	21.0			60	73	63	57
10 I	29	Virgin pasture	8.30	Alma silt loam	1.80	240	7	13.1	11.4	18.0	1.506	[3] 1.451	53	61	57	55
W	30				1.79	121		27.1	27.1	27.7			57	65	66	56

TABLE 6.--Continued

Plot No. and run[1]	Date of run	Land use	Slope	Soil type	Applied rainfall		Top soil depth	Antecedent moisture at--			Volume wt. of soil		Average temperatures			
					Rate	Duration		0-7 inches	7-14 inches	14-21 inches	0-6 inches	Subsoil	Runoff	Soil	Air	Water supply
	1940		Pct.		In./hr.	Minutes	In.	Pct.	Pct.	Pct.			°F.	°F.	°F.	°F.
11 I	July 1	Virgin pasture	1.25	Bogota silt loam	1.78	206	16	12.6	13.9	17.3	1.479	[3]1.582	64	73	75	55
W	2				1.81	82		30.5	32.3	27.2			55	68	64	54
12 I	2	Virgin pasture	1.67	Bogota silt loam	1.80	229	20	13.2	13.4	15.3	1.498	[3]1.465	59	70	70	56
W	3				1.79	86		29.6	28.5	26.6			53	64	59	51
13 I	8	Virgin pasture	15.25	Elco silt loam	1.79	270	10	6.7	12.9	16.5	1.438	1.545	61	77	68	57
W	9				1.81	77		27.2	26.0	25.2			57	74	64	52
14 I	9	Virgin pasture	16.83	Elco silt loam	1.80	233	8	9.0	14.7	15.4	1.495	1.568	60	78	69	55
W	10				1.83	90		25.5	21.8	18.6			58	76	72	51
15 I	10	Pasture	12.11	Elco silt loam	1.80	122	2	7.5	14.8	18.5	1.489	1.453	63	83	75	55
W	11	--do---			1.76	52		18.0	16.6	19.0			60	78	71	56
16 I	12	Pasture	11.11	Elco silt loam	1.80	210	3	7.2	14.9	17.4	1.436	1.409	52	67	51	53
W	13	--do---			1.80	72		26.2	26.2	25.1			50	63	56	49
2 I	15	Alfalfa	9.62	Alma silt loam	1.80	158	[2] 7	12.3	14.0	14.0	1.436	1.556	59	76	62	56
W	16	--do---			1.79	96		20.0	14.4	15.4			55	70	60	52
1 I	17	Alfalfa	11.72	Alma silt loam	1.78	159	4	11.0	14.5	12.9	1.544	1.681	58	75	66	52
W	18	--do---			1.79	88		24.8	21.0	16.6			54	70	65	49
5 I	19	Alfalfa	1.22	Bogota silt loam	1.79	124	15	5.8	7.9	15.3	1.436	1.492	59	76	72	54
W	20	--do---			1.76	[5] 102		22.6	18.5	18.7			56	74	74	48
6 I	23	Alfalfa	1.00	Bogota silt loam	1.80	163.5	14	5.1	6.8	16.7	1.450	[3]1.619	58	76	67	52
W	24	--do---			1.81	160		24.5	21.5	22.0			62	78	75	52
7 I	29	Pasture	1.36	Bogota silt loam	1.79	216	18	4.3	8.0	15.5	1.500	1.411	64	81	81	61
W	30	--do---			1.82	112		24.8	23.2	20.7			59	78	77	58
8 I	Aug. 1	Pasture	1.30	Bogota silt loam	1.78	228	17	3.8	6.0	17.3	1.543	[3]1.461	61	80	79	57
W	2	--do---			1.79	115		22.3	22.2	20.0			59	78	73	56
9 I	2	Virgin pasture	8.27	Alma silt loam	1.82	205	12	4.7	8.0	13.2	1.474	[3]1.471	58	77	76	56
W	3				1.81	218		26.4	22.6	22.0			60	77	78	52
10 I	5	Virgin pasture	8.30	Alma silt loam	1.84	333	7	17.1	13.4	16.9	1.321	[3]1.415	58	78	67	50
W	6				1.81	80		29.0	23.5	26.2			57	72	61	49
11 I	7	Virgin pasture	1.25	Bogota silt loam	1.83	266	16	20.8	21.2	17.8	1.417	[3]1.423	56	72	66	52
W	8				1.82	120		28.7	29.2	25.0			56	76	67	51
12 I	9	Virgin pasture	1.67	Bogota silt loam	1.85	188	20	22.8	20.8	18.1	1.482	1.406	54	74	60	49
W	12				1.77	86		30.8	30.2	27.6			58	76	69	48
13 I	13	Virgin pasture	15.25	Elco silt loam	1.82	176	10	24.4	22.8	24.6	1.332	1.454	78	77	81	74
W	14				1.80	70		27.3	26.0	25.4			79	76	86	73
14 I	15	Virgin pasture	16.83	Elco silt loam	1.76	187	8	22.7	19.2	19.9	1.475	1.398	82	81	89	79
W	16				1.78	81		25.3	25.7	21.9			79	78	88	73
15 I	19	Pasture	12.11	Elco silt loam	1.74	105	2	14.3	17.5	18.6	1.486	---	68	66	69	68
W	20	--do---			1.78	56		23.1	18.9	18.5			67	62	70	65
16 I	20	Pasture	11.11	Elco silt loam	1.82	123	3	16.4	20.8	22.0	1.480	---	71	69	74	68
W	21	--do---			1.81	64		20.5	22.7	21.6			64	64	72	64
4 I	22	New alfalfa	1.30	Bogota silt loam	1.82	224	14	16.1	16.6	17.7	1.391	1.467	73	71	80	71
W	23	--do---			1.80	150		27.6	23.9	23.9			68	67	71	64
3 I	26	New alfalfa	0.83	Bogota silt loam	1.80	[5] 204	14	10.7	12.7	16.0	1.532	1.552	79	78	88	78
W	27	--do---			1.80	146		26.4	23.6	14.7			74	74	79	67
22 I	28	New alfalfa	0.83	Bogota silt loam	1.80	184	15	18.8	12.4	14.6	1.542	1.541	74	76	84	72
W	29	--do---			1.82	121		27.3	25.2	27.5			72	73	81	69

TABLE 6.--Continued

Plot No. and run[1]	Date of run	Land use	Slope	Soil type	Applied rainfall		Top soil depth	Antecedent moisture at--			Volume wt. of soil		Average temperatures			
					Rate	Duration		0-7 inches	7-14 inches	14-21 inches	0-6 inches	Subsoil	Runoff	Soil	Air	
	1940		Pct.		In./hr.	Minutes	In.	Pct.	Pct.	Pct.			°F.	°F.	°F.	°F.
1 I	Aug. 30	Alfalfa	11.72	Alma silt loam	1.82	97	4	13.4	11.0	12.0	1.432	1.514	70	69	77	67
W	31	--do---			1.84	93		22.8	14.2	12.3			68	68	74	68
20 I	Sept. 12	Alfalfa	7.60	Alma silt loam	1.77	190	7	7.4	8.4	12.9	1.476	1.529	58	61	64	60
W	13	--do---			1.79	103		23.4	18.7	17.0			61	61	70	58
6 I	13	Alfalfa	1.00	Bogota silt loam	1.85	163	14	13.5	15.6	21.0	1.478	1.523	60	65	66	58
W	14	--do---			1.83	94		25.6	22.8	24.6			63	64	70	59
18 I	16	Alfalfa	.58	Bogota silt loam	1.78	190	14	6.7	8.6	17.1	1.500	1.514	66	68	57	63
W	17	--do---			1.78	184		24.7	20.6	18.5			64	66	79	60
7 I	18	Pasture	1.36	Bogota silt loam	1.76	[5] 227	18	10.2	13.8	18.8	1.504	1.539	71	72	86	68
W	19	--do---			1.78	130		24.4	23.2	21.8			70	71	86	64
24 I	20	Pasture	2.70	Alma to Bogota silt loam	1.77	178	[2] 8	5.0	12.6	11.6	1.567	1.558	72	74	87	69
W	21	--do---			1.78	80		22.8	16.8	14.8			70	70	81	68
9 I	23	Virgin pasture	8.27	Alma silt loam	1.79	256	12	6.8	13.1	20.1	1.392	1.488	70	71	77	67
W	24				1.82	177		25.8	22.0	22.5			69	70	74	65
26 I	27	Pasture	8.40	Alma silt loam	1.79	163	[2] 3	9.4	15.4	15.5	1.546	1.700	65	64	68	58
W	28	--do---			1.81	76		21.0	16.5	17.0			60	55	65	57
11 I	30	Virgin pasture	1.25	Bogota silt loam	1.84	398	16	7.6	12.6	16.5	1.572	1.584	63	61	74	63
W	Oct. 1				1.76	103		28.6	29.8	26.0			63	60	69	61
27 I	2	Virgin pasture	2.70	Bogota silt loam	1.80	458	14	6.4	7.2	10.4	1.375	1.463	64	64	68	63
W	3				1.79	124		29.6	29.1	25.6			63	62	75	60
13 I	7	Virgin pasture	15.25	Elco silt loam	1.79	278	10	24.3	21.8	21.6	1.420	1.691	62	60	64	61
W	8				1.78	114		26.8	26.3	25.6			59	57	66	60
29 I	9	Pasture	5.50	Elco silt loam	1.78	158	0	17.5	12.4	12.0	1.469	1.720	63	60	68	61
W	10	--do---			1.78	114		23.0	12.3	11.6			60	59	68	60
16 I	11	Pasture	11.11	Elco silt loam	1.79	137	3	19.2	21.6	16.5	1.478	1.649	65	63	70	62
W	12	--do---			1.81	61		22.0	19.0	19.4			66	60	69	63
32 I	14	Pasture	7.80	Alma silt loam	1.79	188	[2] 2	18.0	20.2	16.6	1.555	1.607	67	66	68	64
W	15	--do---			1.78	87		25.1	25.6	23.4			57	54	58	58
2 I	16	Alfalfa	9.62	Alma silt loam	1.77	59	[2] 7	20.4	14.8	13.2	1.490	1.668	56	56	54	57
W	17	--do---			1.80	107		19.0	14.2	17.3			56	54	65	58
17 I	18	New alfalfa	1.20	Bogota silt loam	1.79	90	15	11.5	7.8	14.9	1.510	1.556	57	55	61	60
W	19	--do---			1.77	69		19.1	9.4	15.4			58	55	64	57
4 I	21	New alfalfa	1.30	Bogota silt loam	1.78	262	14	17.0	15.0	19.8	1.454	1.355	59	58	64	60
W	22	--do---			1.78	85		27.7	24.2	22.1			60	68	74	62
21 I	23	New alfalfa	2.70	Bogota silt loam	1.78	229	6	15.0	14.5	17.4	1.476	---	66	63	79	65
					1.90	32										
W	24	--do---		---do----	1.78	161		26.0	24.7	24.1			64	60	73	62
19 I	25	New alfalfa	0.47	Bogota silt loam	1.79	285	12	13.0	11.3	14.9	1.446	1.435	68	66	77	65
W	26	--do---			1.80	119		28.1	26.3	26.3			64	60	72	67
5 I	29	Alfalfa	1.22	Bogota silt loam	1.76	168	15	16.5	15.4	20.0	1.493	1.465	62	63	58	61
W	30	--do---			1.77	165		26.1	25.1	26.8			59	56	59	59
33 I	Nov. 4	Alfalfa	0.0	Bogota silt loam	1.80	308	13	9.7	10.8	15.7	1.423	1.528	61	57	61	60
W	5	--do---			1.78	148		24.4	23.9	24.6			51	53	48	52
8 I	7	Pasture	1.30	Bogota silt loam	1.78	189	17	8.5	9.5	19.4	1.482	1.534	52	48	47	54
W	8	--do---			1.77	98		23.0	21.3	19.8			53	49	49	54

TABLE 6.--Continued

Plot No. and run[1]		Date of run	Land use	Slope	Soil type	Applied rainfall		Top soil depth	Antecedent moisture at--			Volume wt. of soil		Average temperatures			
						Rate	Duration		0-7 inches	7-14 inches	14-21 inches	0-6 inches	Subsoil	Runoff	Soil	Air	Water supply
		1940		Pct.		In./hr.	Minutes	In.	Pct.	Pct.	Pct.			°F.	°F.	°F.	°F.
25	I	Nov. 18	Pasture	0.25	Bogota silt loam	1.78	194	14	9.9	8.7	14.1	1.440	1.556	52	47	49	51
	W	19	--do---			1.79	89		25.1	21.2	19.5			52	48	52	52
12	I	20	Virgin pasture	1.67	Bogota silt loam	1.78	483	20	17.8	15.0	18.7	1.360	1.485	52	49	48	52
	W	21				1.78	101		31.9	29.0	25.6			53	52	53	54
23	I	22	Virgin pasture	4.60	Bogota silt loam	1.78	259	11	19.5	12.8	16.5	1.400	1.547	55	53	57	56
	W	23				1.79	87		27.8	27.4	26.5			48	46	44	48
	2W	25	--do---		---do----	1.78	112							43	41	41	43
10	I	29	Virgin pasture	8.30	Alma silt loam	1.77	270	8	27.4	22.5	22.7	1.485	1.404	48	44	44	48
	W	30				1.77	129		28.2	26.5	26.5			52	46	53	53
28	I	Dec. 6	Virgin pasture	12.00	Alma & Elco silt loam	1.78	344	7	21.9	22.0	18.2	1.526	1.526	50	48	49	51
	W	7				1.77	105		25.4	25.7	26.0			47	43	42	46
14	I	9	Virgin pasture	16.83	Elco silt loam	1.78	274	8	21.3	22.2	20.4	1.480	1.463	54	51	55	56
	W	10				1.78	112		26.1	27.4	23.3			47	40	39	47
30	I	12	Virgin pasture	8.70	Elco silt loam	1.77	141	7	22.9	18.6	13.9	1.440	---	41	40	39	41
	W	13				1.79	69		30.4	28.8	27.4			43	40	37	43
15	I	20	Pasture	12.11	Elco silt loam	1.79	98	2	24.7	26.0	24.8	1.446	1.477	48	41	43	48
	W	21	--do---			1.79	65		25.4	27.7	25.2			42	38	37	46
31	I	23	Pasture	12.40	Elco silt loam	1.78	43	3	25.2	25.4	27.4	1.510	1.378	50	40	46	51
			--do---			1.84	64										
	W	24	Pasture		---do----	1.84	10		27.8	26.0	27.6			43	42	40	44
			--do---		---do----	1.92	59										
		1941															
31A	I	Jan. 14	Pasture	10.04	Elco silt loam	1.78	130	3	26.1	27.7	27.5	1.479	1.409	43	39	41	47
	W	Feb. 4	--do---			1.79	68		25.4	25.1	26.2			42	37	37	42
1	I	12	Alfalfa	11.72	Alma silt loam	1.77	186	4	25.0	24.4	23.0	1.288	1.295	51	46	50	53
6	I	Mar. 10	Alfalfa	1.00	Bogota silt loam	1.79	113	14	26.5	24.5	23.3	---	---	43	40	39	44
3	I	14	New alfalfa	0.83	Bogota silt loam	1.77	167	14	26.5	24.5	26.0	---	---	49	36	45	50
[6]7	I	19	Pasture	1.36	Bogota silt loam	1.76	231	18	25.1	21.7	24.5	1.321	1.373	48	34	48	51
9	I	20	Virgin pasture	8.27	Alma silt loam	1.77	[5]270	12	27.9	25.5	28.6	1.283	1.272	57	50	60	59
11	I	21	Virgin pasture	1.25	Bogota silt loam	1.77	198	16	29.5	27.2	24.6	1.292	1.362	49	42	48	48
13	I	22	Virgin pasture	12.25	Elco silt loam	1.77	160	10	27.5	20.0	24.8	1.340	1.286	52	41	51	55
34	I	25	Virgin pasture	12.20	Elco silt loam	1.77	198	9	28.8	26.6	27.0	1.340	1.286	49	42	44	50
16	I	26	Pasture	11.11	Elco silt loam	1.78	254	3	20.2	25.2	28.7	1.268	1.406	49	42	46	52
42	I	May 5	Pasture	1.05	Bogota silt loam	1.93	169	16	27.8	26.4	27.9	1.396	1.384	65	65	65	65

TABLE 6.--Continued

Plot No. and run[1]	Date of run	Land use	Slope	Soil type	Applied rainfall		Top soil depth	Antecedent moisture at--			Volume wt. of soil		Average temperatures			
					Rate	Duration		0-7 inches	7-14 inches	14-21 inches	0-6 inches	Subsoil	Runoff	Soil	Air	Water supply
	1941		Pct.		In./hr.	Minutes	In.	Pct.	Pct.	Pct.			°F.	°F.	°F.	°F.
44 I	May 8	Virgin pasture	0.50	Bogota silt loam	1.77	399	15	25.3	24.5	21.0	1.426	1.432	62	60	64	62
50 I	9	Pasture	0.95	Bogota silt loam	1.79	243	17	24.8	23.7	22.9	1.414	1.466	62	61	63	59
48 I	12	Pasture	0.75	Bogota silt loam	1.78	233	15	23.1	23.1	26.2	1.453	1.407	61	62	66	58
46 I	13	Pasture	10.70	Alma silt loam	1.78	253	5	24.8	28.5	26.0	1.350	(7)	66	65	70	67
47 I	14	Pasture	3.70	Alma to Bogota silt loam	1.80	269	7	22.0	23.4	25.7	1.605	(7)	63	63	65	64
49 I	15	Pasture	0.80	Bogota silt loam	1.85	353	14	20.7	21.9	26.1	1.394	1.530	71	71	76	73
51 I	16	Pasture	2.70	Bogota silt loam	1.78	309	12	19.3	21.4	24.5	1.455	1.599	70	70	72	71
53 I	20	Virgin pasture	1.60	Bogota silt loam	1.77	241	14	22.3	21.5	25.5	1.373	1.485	68	68	72	69
52 I	21	Virgin pasture	3.00	Alma silt loam	1.80	365	12	20.2	24.4	26.9	1.355	1.384	72	74	76	72
45 I	22	Pasture	18.00	Glacial "C" horizon	1.77	409	8	12.8	21.0	20.4	1.462	1.522	75	75	79	81
W	23	--do---			1.77	185		21.6	21.6	20.0			69	66	73	71
43 I	24	Alfalfa	0.20	Bogota silt loam	1.77	513	18	9.8	12.2	20.6	(7)	---	64	61	70	60
35 I	27	New alfalfa	2.90	Bogota silt loam	1.77	357	11	13.4	19.9	19.1	1.465	1.642	72	72	77	72
36 I	28	New alfalfa	1.30	Bogota silt loam	1.78	453	18	12.0	13.9	22.6	1.438	1.507	74	75	76	73
41 I	29	New alfalfa	0.20	Bogota silt loam	1.76	621	17	8.0	14.3	24.6	1.442	1.421	70	70	73	70
4 I	June 2	New alfalfa	1.30	Bogota silt loam	1.80	475	14	11.6	14.2	22.8	1.446	1.413	73	73	74	74
W	3	--do---			1.78	285		26.4	26.5	27.0			73	72	76	73
3 I	4	New alfalfa	0.83	Bogota silt loam	1.79	481	14	11.4	19.8	25.4	1.531	1.466	66	68	72	66
W	5	--do---			[8]1.84	221		28.6	26.0	25.6			68	70	76	66
40 I	6	Alfalfa	5.20	Bogota silt loam	1.77	429	12	14.0	20.0	20.7	1.452	1.472	70	69	74	70
39 I	9	Alfalfa	0.80	Bogota silt loam	1.78	321	10	6.3	8.5	16.1	1.544	1.749	74	74	79	73
1 I	10	Alfalfa	11.72	Alma silt loam	1.77	337	4	13.3	13.3	11.6	1.495	1.517	72	71	73	72
2 I	11	Alfalfa	9.62	Alma silt loam	1.78	477	[2] 7	16.8	15.4	15.2	1.495	1.517	75	73	76	74
W	12	--do---			1.77	245		26.6	24.6	20.0			70	68	70	71
38 I	16	Alfalfa	1.90	Bogota silt loam	1.77	409	15	19.0	18.1	22.5	1.482	1.548	68	67	74	66
37 I	17	Alfalfa	1.00	Bogota silt loam	1.78	361	19	18.0	18.1	23.4	1.413	1.556	70	67	76	70
6 I	18	Alfalfa	1.00	Bogota silt loam	1.78	361	14	16.4	17.1	24.3	1.491	1.464	72	70	78	71
W	19	--do---			1.78	373		25.5	25.8	24.5			72	70	76	72

TABLE 6.--Continued

Plot No. and run[1]	Date of run	Land use	Slope	Soil type	Applied rainfall		Top soil depth	Antecedent moisture at--			Volume wt. of soil		Average temperatures			
					Rate	Duration		0-7 inches	7-14 inches	14-21 inches	0-6 inches	Subsoil	Runoff	Soil	Air	Water supply
	1941		Pct.		In./hr.	Minutes	In.	Pct.	Pct.	Pct.			°F.	°F.	°F.	°F.
5 I	June 20	Alfalfa	1.22	Bogota silt loam	1.78	457	15	15.6	15.6	19.2	1.472	1.409	75	75	80	75
W	21	--do---			1.79	269		27.6	27.2	27.2			73	72	79	75
7 I	24	Pasture	1.36	Bogota silt loam	1.78	130	18	5.8	8.2	20.2	1.476	1.338	78	75	83	77
W1	25	--do---			1.78	341		19.4	18.0	13.8			78	77	81	79
W2	26	--do---		---do----	1.79	341							79	77	82	80
8 I	27	Pasture	1.30	Bogota silt loam	1.78	473	17	5.2	9.7	20.4	1.467	1.527	78	78	80	80
W	28	--do---			1.77	149		27.1	25.6	26.9			76	75	76	75
9 I	July 1	Virgin pasture	8.27	Alma silt loam	1.77	477	12	14.8	11.7	15.4	1.414	1.439	80	80	83	82
W	2				1.77	331		27.9	26.4	25.8			76	74	77	76
10 I	2	Virgin pasture	8.30	Alma silt loam	1.77	349	7	14.2	12.6	18.4	1.448	1.405	74	74	73	72
W	3				1.78	177		27.6	27.1	28.2			66	66	66	64
11 I	8	Virgin pasture	1.25	Bogota silt loam	1.79	[9] 422	16	7.9	9.0	8.1	1.444	1.549	73	74	78	74
W	9				1.78	205		29.0	29.5	25.8			73	72	75	73
12 I	10	Virgin pasture	1.67	Bogota silt loam	1.78	397	20	13.6	12.2	11.1	1.444	1.549	71	71	72	71
W	11				1.79	169		31.0	30.8	27.9			72	72	69	74
13 I	15	Virgin pasture	15.25	Elco silt loam	1.78	417	10	21.2	19.8	17.8	1.443	1.518	75	75	82	78
W	16				1.78	205		25.4	26.5	24.4			74	71	81	73
14 I	17	Virgin pasture	16.83	Elco silt loam	1.78	609	8	17.4	21.5	17.4	1.423	1.416	74	73	78	72
W	18				1.78	165		26.1	26.8	24.4			74	75	80	76
15 I	21	Virgin pasture	12.11	Elco silt loam	1.77	253	2	11.4	16.3	19.4	1.467	([7])	78	78	82	81
W	22				1.78	133		22.8	22.1	22.3			78	77	81	80
16 I	23	Virgin pasture	11.11	Elco silt loam	1.80	245	3	11.3	16.2	17.8	1.568	([7])	78	78	82	78
W	24				1.78	169		25.1	22.9	19.4			76	76	79	76

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[1] I = initial run; W = run.
[2] Topsoil mixed with subsoil.
[3] Not subsoil; 5- to 7-inch layer.
[4] 12-minute interval without rain.
[5] Interval without rain
[6] One and one-half inch frost in ground; plot badly trampled by cattle.
[7] Soil sample crumbled.
[8] Graduated from 1.78 to 1.89 inches per hour rainfall.
[9] No rain from 54 to 68 minutes; not included in duration.

TABLE 7.--Rate and volume of runoff at various increments of time from start of infiltration run as measured by type "F" infiltrometer

Plot No. and run[1]		Rate of runoff										Final rate	Accumulated runoff										Total[2]
		Minutes form start											Minutes from start										
		15	30	60	90	120	180	240	300	360	420		15	30	60	90	120	180	240	300	360	420	
		In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
7	I	0.93	1.20	1.38	1.47	---	---	---	---	---	---	1.47	1.25	0.40	1.07	---	---	---	---	---	---	---	1.55
	W	1.12	1.55	---	---	---	---	---	---	---	---	1.55	.08	.42	---	---	---	---	---	---	---	---	.60
8	I	.50	1.60	1.78	---	---	---	---	---	---	---	1.78	.02	.34	1.19	---	---	---	---	---	---	---	1.61
	W	1.00	1.77	1.90	---	---	---	---	---	---	---	1.90	.08	.46	---	---	---	---	---	---	---	---	1.26
2	I	.74	1.36	1.64	1.76	---	---	---	---	---	---	1.78	.06	.34	1.12	1.97	---	---	---	---	---	---	2.39
	W	1.65	1.77	1.78	---	---	---	---	---	---	---	1.78	.23	.66	---	---	---	---	----	---	---	---	1.66
1	I	.25	1.07	1.51	---	---	---	---	---	---	---	1.51	(3)	---	---	---	---	---	---	---	---	---	---
	W	1.48	1.58	1.58	---	---	---	---	---	---	---	1.58	.18	.57	---	---	---	---	---	---	---	---	.57
	2W	3.26	3.36	---	---	---	---	---	---	---	---	3.36	.55	1.38	---	---	---	---	---	---	---	---	1.32
5	I	.04	.75	1.45	1.54	---	---	---	---	---	---	1.54	.01	.08	.69	---	---	---	---	---	---	---	1.13
	W	.50	1.50	1.57	---	---	---	---	---	---	---	1.57	.02	.33	---	---	---	---	---	---	---	---	.90
6	I	.01	.40	1.17	1.22	---	---	---	---	---	---	1.22	0	.02	.48	---	---	---	---	---	---	---	.80
	W	.50	1.42	1.48	---	---	---	---	---	---	---	1.48	.02	.32	---	---	---	---	---	---	---	---	.71
9	I	.24	.88	1.24	1.29	---	---	---	---	---	---	1.29	.02	.17	.72	---	---	---	---	---	---	---	1.10
	W	1.00	1.41	1.45	---	---	---	---	---	---	---	1.45	.08	.41	---	---	---	---	---	---	---	---	.84
10A	I[4]	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	W	.90	1.43	1.54	---	---	---	---	---	---	---	1.54	.06	.38	1.12	---	---	---	---	---	---	---	1.12
13	I	.16	.38	.73	1.08	1.22	---	---	---	---	---	1.26	.02	.08	.35	.82	1.40	---	---	---	---	---	1.67
	W	.97	1.47	1.64	1.77	---	---	---	---	---	---	[5] 1.77e	.09	.41	1.22	---	---	---	---	---	---	---	1.42
14	I	.55	1.21	1.36	---	---	---	---	---	---	---	1.36[e]	.03	.28	---	---	---	---	---	---	---	---	.72
	W	1.29	1.40	1.44	1.44	---	---	---	---	---	---	1.44[e]	.14	.48	1.18	---	---	---	---	---	---	---	1.49
15	I	.20	.70	1.17	1.30	1.36	---	---	---	---	---	1.36[e]	.03	.14	.64	1.26	---	---	---	---	---	---	1.76
	W	1.13	1.31	1.36	---	---	---	---	---	---	---	1.36[e]	.15	.46	---	---	---	---	---	---	---	---	.77
16	I	.03	.23	.78	.99	1.04	---	---	---	---	---	1.04[e]	0	.03	.29	.74	---	---	---	---	---	---	1.22
	W	.75	1.02	1.10	---	---	---	---	---	---	---	1.10[e]	.06	.29	---	---	---	---	---	---	---	---	.68
12	I	.04	.20	.71	.90	1.16	1.70	---	---	---	---	1.75	.01	.03	.31	.72	1.23	2.69	---	---	---	---	3.17
	W	.78	1.76	1.76	---	---	---	---	---	---	---	1.76[e]	.04	.44	---	---	---	---	---	---	---	---	.64
11	I	.02	.02	.02	.12	.42	1.48	1.58	---	---	---	1.58[e]	0	.01	.02	.05	.16	1.29	2.64	---	---	---	2.32
	W	.10	1.68	1.76	---	---	---	---	---	---	---	1.76[e]	0	.27	---	---	---	---	---	---	---	---	1.00
1	I	.12	.52	.95	1.25	1.36	1.41	---	---	---	---	1.41[e]	0	.12	.49	1.06	1.71	---	---	---	---	---	2.48
	W	1.42	1.46	1.46	---	---	---	---	---	---	---	1.46	.17	.53	1.27	---	---	---	---	---	---	---	1.51
2	I	13	.66	1.12	1.31	1.37	----	---	---	---	---	1.40	.01	.11	.57	1.18	1.84	---	---	---	---	---	2.43
	W	1.09	1.26	1.28	1.33	---	---	---	---	---	---	[6] 1.46	.12	.42	1.06	1.70	---	---	---	---	---	---	1.84
5	I	(7)	.51	1.30	1.44	1.51	---	---	---	---	---	1.51	0	.04	.56	1.26	2.00	---	---	---	---	---	2.09
	W	.25	.85	1.05	---	---	---	---	---	---	---	1.05	.01	.15	.66	---	---	---	---	---	---	---	0.71
6	I	.01	.11	1.13	1.28	1.48	---	---	---	---	---	1.48	0	.01	.39	1.00	1.68	---	---	---	---	---	1.80
	W	.09	1.21	1.41	1.55	1.56	---	---	---	---	---	1.56	0	.21	.88	1.62	2.40	---	---	---	---	---	2.40
7	I	.35	.79	1.09	1.25	1.31	---	---	---	---	---	1.31	.02	.17	.66	1.25	1.90	---	---	---	---	---	2.34
	W	.65	1.30	1.40	---	---	---	---	---	---	---	1.40	.03	.32	1.00	---	---	---	---	---	---	---	1.14
8	I	0	.20	.80	1.10	1.23	---	---	---	---	---	1.26	---	.02	.27	.76	1.34	---	---	---	---	---	1.76
	W	.16	1.06	1.39	---	---	---	---	---	---	---	1.39	.01	.16	.81	---	---	---	---	---	---	---	0.95
9	I	.06	.30	.67	.82	.91	.98	---	---	---	---	.98[e]	0	.05	.55	.67	1.11	---	---	---	---	---	1.82
	W	.28	.51	.92	1.19	---	---	---	---	---	---	1.19	.02	.12	.45	1.00	---	---	---	---	---	---	1.00
10	I	.34	.69	.75	.79	.89	1.08	1.43	---	---	---	1.43	.02	.16	.52	.90	1.32	2.30	3.58	---	---	---	3.58
	W	.63	1.22	1.64	1.73	1.75	---	---	---	---	---	1.75	.04	.29	1.03	1.87	2.74	---	---	---	---	---	2.77
11	I	.01	.02	.09	.22	.83	1.56	---	---	---	---	1.58	0	0	.03	.10	.34	1.67	---	---	---	---	2.36
	W	.13	1.47	1.61	1.64	---	---	---	---	---	---	1.64[e]	0	.24	1.02	---	---	---	---	---	---	---	1.63
12	I	.01	.04	.13	.37	.81	1.43	1.58	---	---	---	1.58	0	.01	.05	.17	.45	1.62	---	---	---	---	2.89
	W	.20	1.50	1.66	1.67	---	---	---	---	---	---	1.67[e]	.01	.28	1.07	---	---	---	---	---	---	---	1.78
13	I	.08	.15	.38	.53	.68	.98	1.36	1.46	---	---	1.46[e]	0	.04	.17	.40	.70	1.54	2.72	---	---	---	3.42
	W	1.00	1.43	1.56	1.56	---	---	---	---	---	---	1.56[e]	.08	.38	1.14	---	---	---	---	---	---	---	1.58
14	I	.06	.53	1.09	1.23	1.30	1.34	1.37	---	---	---	1.37[e]	0	.10	.52	1.11	1.74	3.06	---	---	---	---	4.26
	W	1.01	1.20	1.28	1.33	---	---	---	---	---	---	1.33	.08	.37	.99	1.64	---	---	---	---	---	---	1.64
15	I	.21	.65	1.21	1.37	1.42	---	---	---	----	---	1.42	.02	.12	.61	1.26	1.96[e]	---	---	---	---	---	1.92
	W	1.22	1.37	1.40	1.52	---	---	---	---	---	---	[6] 1.52[e]	.13	.47	---	---	---	---	---	---	---	---	0.97
16	I	.01	.48	1.10	1.30	1.40	1.48	---	---	---	---	1.48	0	.04	.46	1.07	1.74	3.18	---	---	---	---	3.92
	W	1.23	1.36	1.45	1.45	---	---	---	---	---	---	1.45[e]	.12	.45	1.16	---	---	---	---	---	---	---	1.45

TABLE 7.--Continued.

Plot No. and run[1]		Rate of runoff											Accumulated runoff										
		Minutes from start										Final rate	Minutes from start										Total[2]
		15	30	60	90	120	180	240	300	360	420		15	30	60	90	120	180	240	300	360	420	
			In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
2	I	.03	0.38	1.18	1.40	1.51	1.59	---	---	---	---	1.59^{e}	0.01	0.04	0.48	1.13	1.86	---	---	---	---	---	2.85
	W	1.38	1.55	1.60	1.60	---	---	---	---	---	---	1.60	.15	.52	1.31	2.11	---	---	---	---	---	---	2.27
1	I	.16	.56	1.11	1.41	1.56	1.63	---	---	---	---	1.63^{e}	.01	.10	.53	1.16	1.92	---	---	---	---	---	2.96
	W	1.48	1.64	1.67	1.70	---	---	---	---	---	---	1.70^{e}	.16	.56	1.39	2.20^{e}	---	---	---	---	---	---	2.18
5	I	.01	.03	1.02	1.34	1.43	---	---	---	---	---	1.43	0	0	.29	.89	1.59	---	---	---	---	---	1.69
	W	.10	1.25	1.42	1.47	1.48	---	---	---	---	---	1.48^{e}	0	.19	.90	1.70^{e}	---	---	---	---	---	---	1.95
6	I	.02	.03	.53	.88	1.10	1.23	---	---	---	---	1.23^{e}	0	.01	.11	.47	.97	---	---	---	---	---	1.82
	W	.08	1.09	1.24	1.28	1.29	1.31	---	---	---	---	1.31^{e}	0	.16	.76	1.39	2.04	---	---	---	---	---	2.90
7	I	.02	.23	.68	.93	1.11	1.28	1.32	---	---	---	1.32^{e}	0	.02	.27	.68	1.18	2.39	---	---	---	---	3.18
	W	.40	1.12	1.29	1.37	1.37	---	---	---	---	---	1.37^{e}	.02	.25	.86	1.53	---	---	---	---	---	---	2.03
8	I	.06	.18	.42	.80	.99	1.16	1.23	---	---	---	1.23^{e}	0	.03	.17	.48	.94	2.04	---	---	---	---	3.00
	W	.24	1.01	1.31	1.37	1.37	---	---	---	---	---	1.37^{e}	.01	.17	.78	1.45	---	---	---	---	---	---	2.01
9	I	(7)	.10	.31	.51	.65	.73	.73	---	---	---	.73^{e}	0	0	.11	.32	.61	1.31	---	---	---	---	1.61
	W	.31	.46	.77	1.08	1.23	1.45	1.49	---	---	---	1.49^{e}	.03	.13	.42	.89	1.46	2.80	---	---	---	---	3.73
10	I	.12	.41	.59	.82	1.10	1.43	1.65	1.78	1.78	---	1.78^{e}	0	.09	.32	.68	1.17	2.47	4.02	5.74	---	---	6.68
	W	1.00	1.60	1.73	1.73	---	---	---	---	---	---	1.73^{e}	.06	.41	1.26	---	---	---	---	---	---	---	1.83
11	I	0	.01	.02	.04	.78	1.59	1.65	---	---	---	1.69	0	0	.01	.02	.17	1.50	3.12	---	---	---	3.84
	W	.10	1.35	1.68	1.73	1.75	---	---	---	---	---	1.75	0	.18	.98	1.84	2.71	---	---	---	---	---	2.71
12	I	.01	.01	.01	.31	1.29	1.69	---	---	---	---	1.69	0	0	.01	.05	.47	2.01	---	---	---	---	2.24
	W	.16	1.63	1.77	1.77	---	---	---	---	---	---	1.77^{e}	.01	.27	1.13	---	---	---	---	---	---	---	1.90
13	I	.59	.80	1.02	1.26	1.35	1.41	---	---	---	---	1.41^{e}	.06	.24	.70	1.27	1.92	---	---	---	---	---	3.22
	W	.61	1.23	1.58	---	---	---	---	---	---	---	1.58	.05	.28	1.02	---	---	---	---	---	---	---	1.28
14	I	.57	.83	1.06	1.18	1.27	1.37	---	---	---	---	1.37	.05	.23	.71	1.25	1.86	3.20	---	---	---	---	3.36
	W	1.24	1.42	1.50	1.50	---	---	---	---	---	---	1.50^{e}	.15	.49	1.22	---	---	---	---	---	---	---	1.74
15	I	1.07	1.33	1.46	1.52	---	---	---	---	---	---	1.52	.13	.44	1.14	1.90	---	---	---	---	---	---	2.28
	W	1.51	1.59	1.60	---	---	---	---	---	---	---	1.60^{e}	.21	.62	1.42	---	---	---	---	---	---	---	1.31
16	I	1.18	1.42	1.59	1.63	1.66	---	---	---	---	---	1.66	.13	.46	1.22	2.03	2.85	---	---	---	---	---	2.94
	W	1.60	1.63	1.71	---	---	---	---	---	---	---	1.71	.24	.65	1.49	---	---	---	---	---	---	---	1.60
4	I	.06	.44	.65	.70	.79	.97	1.04	---	---	---	1.04^{e}	0	.08	.36	.70	1.07	1.95	---	---	---	---	2.70
	W	.45	.71	1.04	1.17	1.26	---	---	---	---	---	1.28	.05	.21	.65	1.20	1.81	---	---	---	---	---	2.45
3	I	.23	.65	1.04	1.13	1.15	1.15	1.15	---	---	---	1.15^{e}	.02	.12	.57	1.12	1.70	2.85^{e}	---	---	---	---	3.12
	W	.60	1.25	1.30	1.30	1.30	---	---	---	---	---	1.30	.06	.32	.96	1.63	2.28	---	---	---	---	---	2.83
22	I	.40	.80	1.08	1.18	1.28	1.30	---	---	---	---	1.30	.03	.19	.68	1.25	1.87	3.16	---	---	---	---	3.24
	W	.56	.99	1.29	1.31	1.31	---	---	---	---	---	1.31	.05	.25	.85	1.49	2.14	---	---	---	---	---	2.16
1	I	.82	1.25	1.56	1.65	---	---	---	---	---	---	1.65	.09	.35	1.06	1.88	---	---	---	---	---	---	2.06
	W	1.57	1.74	1.79	1.79	---	---	---	---	---	---	1.79	.21	.63	1.52	2.41	---	---	---	---	---	---	2.50
20	I	0.55	1.08	1.35	1.40	1.44	1.51	---	---	---	---	1.51	.04	.27	.88	1.55	2.28	3.78	---	---	---	---	4.03
	W	1.19	1.43	1.56	---	---	---	---	---	---	---	1.56	.13	.47	1.22	1.99	---	---	---	---	---	---	2.34
6	I	.07	.27	1.09	1.33	1.46	1.52	---	---	---	---	1.52^{e}	0	.04	.41	1.03	1.73	---	---	---	---	---	2.79
	W	.35	1.30	1.47	1.47	---	---	---	---	---	---	1.47	.02	.26	.96	1.70	---	---	---	---	---	---	1.79
18	I	.03	.32	.66	.89	1.07	1.16	---	---	---	---	1.16	0	.04	.30	.68	1.20	2.30	---	---	---	---	2.49
	W	.30	.83	1.13	1.21	1.27	1.30	---	---	---	---	1.30	.02	.17	.69	1.28	1.89	3.18	---	---	---	---	3.26
7	I	.11	.60	1.08	1.22	1.28	1.36	1.42	---	---	---	1.42	.01	.10	.55^{e}	1.14^{e}	1.76^{e}	3.09^{e}	4.49^{e}	---	---	---	4.02
	W	.69	1.41	1.50	1.52	1.52	---	---	---	---	---	1.52	.04	.34	1.08	1.84	2.60	---	---	---	---	---	2.85
24	I	.28	.88	1.37	1.40	1.40	1.40	---	---	---	---	1.40^{e}	.02	.18	.78	1.48	2.18	---	---	---	---	---	3.53
	W	.98	1.44	1.46	1.46	---	---	---	---	---	---	1.46^{e}	.13	.45	1.18	---	---	---	---	---	---	---	1.66
9	I	.03	.39	.73	.93	1.08	1.22	1.27	---	---	---	1.27	0	.06	.36	.78	1.29	2.45	3.70	---	---	---	4.03
		.91	1.29	1.38	1.40	1.44	1.48	---	---	---	---	1.48^{e}	.09	.38	1.06	1.75	2.46	3.96^{e}	---	---	---	---	3.87
26	I	1.08	1.38	1.47	1.52	1.58	1.58	---	---	---	---	1.58^{e}	.11	.43	1.16	1.92	2.68	---	---	---	---	---	3.81
	W	1.47	1.58	1.62	---	---	----	---	---	---	---	1.62	.22	.60	1.41	---	---	---	---	---	---	---	1.84
11	I	.02	.05	.18	.33	.45	.70	1.23	1.56	1.70	1.74	1.74^{e}	0	.01	.06	.18	.38	.95	1.87	3.30	4.94	---	6.09
	W	.37	1.42	1.63	1.67	---	---	---	---	---	---	1.68	.02	.26	1.07	1.90	---	---	---	---	---	---	2.27
27	I	.06	.12	.22	.31	.34	.42	.58	.93	1.28	1.48	1.51	.01	.02	.10	.24	.41	.78	1.24	2.00	3.10	4.48	5.44
	W	.24	1.25	1.49	1.56	1.56	---	----	---	---	---	1.56	.01	.22	.92	1.69	2.47	---	---	---	---	---	2.52
13	I	.58	.71	.79	.85	.99	1.30	1.48	1.50	---	---	1.50^{e}	.05	.21	.60	1.01	1.48	2.61	3.99	---	---	---	4.94
	W	.95	1.38	1.57	1.58	1.58	---	---	---	---	---	1.58^{e}	.09	.38	1.13	1.93	2.76	---	---	---	---	---	2.58

TABLE 7.--Continued.

Plot No. and run[1]		Rate of runoff											Accumulated runoff										
		Minutes from start										Final rate	Minutes from start										Total[2]
		15	30	60	90	120	180	240	300	360	420		15	30	60	90	120	180	240	300	360	420	
		In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
29	I	1.28	1.43	1.56	1.58	1.59	1.59	---	---	---	---	1.59^{e}	.16	.51	1.30	2.08	2.86	---	---	---	---	---	3.87
	W	1.63	1.66	1.66	1.66	1.66	---	---	---	---	---	1.66^{e}	.28	.70	1.58	2.36	3.17^{e}	---	---	---	---	---	3.02
16	I	1.35	1.54	1.61	1.62	1.62	---	---	---	---	---	1.62	.15	.52	1.30	2.10	2.93	---	---	---	---	---	3.39
	W	1.61	1.68	1.68	---	---	---	---	---	---	---	1.68	.25	.66	1.50	---	---	---	---	---	---	---	1.53
32	I	.55	1.10	1.31	1.36	1.43	1.47	---	---	---	---	1.47	.02	.25	.62	1.53	2.23	3.69	---	---	---	---	3.88
	W	1.41	1.55	1.55	1.55	---	---	---	---	---	---	1.55^{e}	.14	.52	1.30	---	---	---	---	---	---	---	2.00
2	I	.53	1.00	1.18	---	---	---	---	---	---	---	1.18^{e}	.04	.25	.87^{e}	---	---	---	---	---	---	---	0.79
	W	1.20	1.38	1.46	1.51	1.51	---	---	---	---	---	1.51^{e}	.12	.45	1.16	1.90	---	---	---	---	---	---	2.33
17	I	.05	1.12	1.43	1.47	---	---	---	---	---	---	1.47	0	.12	.81	1.54	---	---	---	---	---	---	1.54
	W	.90	1.52	1.60	---	---	----	---	---	---	---	1.60	.07	.42	1.20	1.44	---	---	---	---	---	---	1.44^{e}
4	I	.11	.15	.19	.35	.67	1.13	1.30	---	---	---	1.30	.01	.04	.12	.24	.50	1.45	2.68	---	---	---	3.16
	W	.23	.83	1.44	1.44	---	---	---	---	---	---	1.44^{e}	.03	.13	.78	---	---	---	---	---	---	---	1.38
21	I	.25	.73	.85	.91	1.02	1.10	1.20	---	---	---	1.11 1.21	.01	.15	.54	.98	1.47	2.53	3.64	---	---	---	4.07
	W	.84	1.06	1.13	1.15	1.27	1.30	---	---	---	---	1.30^{e}	.09	.33	.87	1.45	2.04	---	---	---	---	---	2.92
19	I	.01	.05	.11	.20	.28	.67	.84	.91	---	---	0.91^{e}	0	.01	.05	.12	.25	.71	1.50	---	---	---	2.76
	W	.13	.50	.96	1.00	1.00	---	---	---	---	---	1.00^{e}	.01	.09	.50	.98	1.49^{e}	---	---	---	---	---	1.48
5	I	0	.19	.87	1.16	1.32	1.40	---	---	---	---	1.40^{e}	(7)	.01	.29	.81	1.43	---	---	---	---	---	2.53
	W	.35	1.30	1.53	1.55	1.57	1.61	---	---	---	---	1.61^{e}	.01	.26	.99	1.76	2.54	---	---	---	---	---	3.74
33	I	0	0	.02	.30	.91	1.34	1.45	1.51	---	---	1.51	(7)	0	0	.06	.38	1.56	2.96	4.46	---	---	4.66
	W	.05	.50	1.46	1.53	1.55	---	---	---	---	---	1.55	0	.06	.65	1.40	2.15	---	---	---	---	---	2.88
8	I	.33	.79	1.07	1.18	1.27	1.32	---	---	---	---	1.32	.06	.21	.68	1.24	1.86	3.16	---	---	---	---	3.36
	W	.38	1.29	1.51	1.53	---	---	---	---	---	---	1.53	.03	.26	.98	1.74	---	---	---	---	---	---	1.95
25	I	.16	.59	.99	1.11	1.15	1.16	---	---	---	---	1.16	.01	.10	.53	1.05	1.61	2.77	----	---	---	---	3.04
	W	.20	.99	1.35	1.34	---	---	---	---	---	---	1.34^{e}	.01	.15	.79	1.45^{e}	---	---	---	---	---	---	1.43
12	I	.10	.22	.62	.68	.74	1.01	1.32	1.45	1.57	1.66	1.70	.01	.04	.28	.60	.96	1.80	2.97	4.35	5.87	7.49	9.26
	W	.62	1.68	1.73	1.73	---	---	---	---	---	---	1.73	.04	.39	1.24	2.10	---	---	---	---	---	---	2.43
23	I	.43	.84	.95	.95	.98	1.05	1.05	---	---	---	1.05	.02	.20	.65	1.12	1.59	2.60	3.66	---	---	---	4.00
	W	.84	1.33	1.41	1.41	---	---	---	---	---	---	1.41^{e}	.05	.34	1.03	1.74^{e}	---	---	---	---	---	---	1.67
	2W	.78	1.25	1.38	1.45	1.45	---	---	---	---	---	1.45^{e}	.05	.32	.99	1.70	2.43^{e}	---	----	---	---	---	2.23
10	1	.80	1.08	1.13	1.16	1.22	1.31	1.49	---	---	---	1.51	.04	.29	.85	1.42	2.02	3.29	4.69	---	---	---	5.45
	W	1.25	1.45	1.51	1.56	1.58	---	---	---	---	---	1.58	.09	.44	1.18	1.95	2.74	---	---	---	---	---	2.98
28	I	.27	.83	.94	.99	1.00	1.06	1.24	1.42	1.46	---	1.46^{e}	.01	.16	.62	1.10	1.60	2.62	3.77	5.11	---	---	6.18
	W	.93	1.36	1.56	1.62	1.62	---	---	---	---	---	1.62^{e}	.06	.38	1.12	1.92	---	---	---	---	---	---	2.33
14	I	.89	1.10	1.23	1.26	1.28	1.37	1.45	1.45	---	---	1.45^{e}	.07	.34	.92	1.53	2.17	3.51	4.92	---	---	---	5.74
	W	1.49	1.55	1.62	1.64	1.64	---	---	---	---	---	1.64^{e}	.18	.56	1.36	2.17	---	---	---	---	---	---	2.78
30	I	.96	1.28	1.42	1.42	1.42	---	---	---	---	---	1.42	.09	.38	1.06	1.78	2.48	---	---	---	---	---	2.97
	W	1.62	1.68	1.68	---	---	---	---	---	---	---	1.68	.19	.61	1.44	---	---	---	---	---	---	---	1.70
15	I	1.55	1.63	1.66	1.66	---	---	---	---	---	---	1.66	.22	.62	1.45	2.28	---	---	---	---	---	---	2.50
	W	1.73	1.74	1.74	---	---	---	---	---	---	---	1.74	.28	.71	1.52	---	---	---	---	---	---	---	1.67
31	I	1.33	1.50	1.60	1.61	1.61	---	---	---	---	---	1.61^{e}	.17	.54	1.30	2.10	---	---	---	---	---	---	2.56
	W	1.60	1.71	1.74	---	---	---	---	---	---	---	1.74	.24	.66	1.53	---	---	---	---	---	---	---	1.80
1941																							
31A	I	.83	1.12	1.38	1.42	1.44	---	---	---	---	---	1.44	.09	.34	.99	1.69	2.41	---	---	---	---	---	2.65
	W	.79	1.18	1.43	1.53^{e}	---	---	---	---	---	---	[6] 1.63	.09	.35	1.00	---	---	---	---	---	---	---	1.20
1	I	.67	1.29	1.61	1.64	1.66	1.66	---	---	---	---	1.66	.04	.31	1.06	1.88	2.80	4.37	---	---	---	---	4.54
6	I	.14	.89	1.38	1.60	1.68	---	---	---	---	---	1.68^{e}	.01	.14	.73	1.48	---	---	---	---	---	---	2.12
3	I	.03	.33	1.20	1.49	1.59	1.64	---	---	---	---	1.64^{e}	.01	.04	.41	1.09	1.87	3.51	---	---	---	---	3.13
7	I	.47	1.21	1.49	1.56	1.62	1.69	1.69	---	---	---	1.69^{e}	.03	.29	.92	1.64	2.42	4.06	5.75	---	---	---	5.48
9	I	.40	.55	1.17	1.50	1.54	1.56	1.59	1.59	---	---	1.59^{e}	.02	.16	.59	1.22	1.98	3.54	5.12	---	---	---	5.92
11	I	.02	.09	1.33	1.66	1.70	1.76	---	---	---	---	1.76	0	.01	.33	1.11	1.96	3.69	---	---	---	---	4.22
13	I	.23	.40	1.20	1.38	1.38	1.38	---	---	---	---	1.38^{e}	.02	.09	.50	1.15	1.85	---	---	---	---	---	2.79
34	I	.37	.50	1.04	1.10	1.11	1.11	---	---	---	---	1.11	.04	.16	.56	1.11	1.66	2.76	---	---	---	---	3.10
16	I	.44	.83	1.14	1.40	1.50	1.58	1.60	---	---	---	1.60	.02	.20	.70	1.34	2.07	3.64	5.25	---	---	---	5.63
42	I	.15	.99	1.44	1.62	1.78	1.90	---	---	---	---	1.90^{e}	.01	.17	.81	1.57	2.42	---	---	---	---	---	3.93
44	I	.30	.50	.70	.93	1.11	1.25	1.31	1.41	1.50	---	[6] 1.50	.04	.14	.45	.85	1.38	2.55	3.83	5.20	6.64	---	7.55

TABLE 7.--Continued.

Plot No. and run[1]		Rate of runoff											Accumulated runoff										
		Minutes from start										Final rate	Minutes from start										Total[2]
		15	30	60	90	120	180	240	300	360	420		15	30	60	90	120	180	240	300	360	420	
		In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
50	I	0.43	1.06	1.26	1.35	1.42	1.60	1.65	---	---	---	[6] 1.71	0.04	0.25	0.84	1.50	2.19	3.70	5.34	---	---	---	5.42
48	I	.50	.93	1.22	1.31	1.37	1.45	1.45	---	---	---	1.45^{e}	.07	.24	.81	1.44	2.11	3.51	---	---	---	---	4.79
46	I	.35	.95	1.20	1.33	1.41	1.55	1.57	---	---	---	1.57	.03	.20	.75	1.39	2.08	3.57	5.14	---	---	---	5.48
47	I	.09	.25	.86	1.22	1.44	1.63	1.72	---	---	---	1.72	.01	.05	.33	.85	1.52	3.07	4.75	---	---	---	5.58
49	I	.28	.90	1.18	1.24	1.30	1.43	1.54	1.58	1.60	---	1.60^{e}	.03	.18	.72	1.32	1.96	3.34	4.82	6.38	---	---	7.78
51	I	.25	.72	1.14	1.32	1.41	1.52	1.56	1.58	---	---	[6] 1.61	.02	.15	.63	1.25	1.94	3.41	4.94	6.51	---	---	6.75
53	I	.05	.08	.83	1.38	1.50	1.59	1.59	---	---	---	1.59	.01	.02	.16	.74	1.47	3.03	4.62	---	---	---	4.64
52	I	.08	.12	.30	.55	1.02	1.50	1.61	1.63	1.66	---	1.66	.01	.04	.15	.35	.71	2.04	3.60	5.22	6.87	---	7.01
45	I	.94	1.16	1.25	1.27	1.28	1.31	1.38	1.52	1.60	1.68	1.68^{e}	.12	.40	.99	1.62	2.26	3.55	4.88	6.34	7.95	---	9.29
	W	1.40	1.55	1.63	1.66	1.69	1.72	---	---	---	---	1.72	.18	.56	1.35	2.19	3.03	4.70	---	---	---	---	4.88
43	I	.07	.11	.25	.36	.45	.78	1.18	1.40	1.54	1.60	1.64	.01	.03	.12	.25	.47	1.04	1.70	3.34	4.81	6.36	8.87
35	I	.22	.78	1.25	1.42	1.45	1.57	1.62	1.66	1.70^{e}	---	[6] 1.74	.03	.13	.68	1.35	2.08	3.59	5.20	6.84	---	---	8.47
36	I	.12	.20	.29	.61	.97	1.24	1.39	1.48	1.60	1.68	[6] 1.72	.01	.05	.18	.40	.80	1.91	3.23	4.67	6.21	7.84	8.76
41	I	.07	.11	.18	.70	.93	1.04	1.06	1.18	1.33	1.47	1.65	.01	.03	.10	.32	.73	1.76	2.80	3.19	5.18	6.58	11.82
4	I	.03	.10	.22	.45	1.24	1.52	1.58	1.60	1.64	1.64	1.64	0	.02	.09	.23	.70	2.12	3.68	5.28	6.92	8.56	10.07
	W	.41	1.48	1.59	1.60	1.63	1.65	1.68	1.68	---	---	1.68^{e}	.05	.30	1.08	1.87	2.67	4.31	5.97	---	---	---	7.24
3	I	0	.03	.15	.60	1.12	1.49	1.58	1.65	1.67	1.68	1.70	0	0	.05	.22	.64	1.99	3.51	5.12	6.77	8.45	10.18
	W	.31	1.47	1.67	1.68	1.71	1.75	1.77	---	---	---	1.77	.15	.28	1.08	1.93	2.77	4.49	---	---	---	---	5.70
40	I	.23	.66	1.06	1.31	1.40	1.50	1.54	1.56	1.57	1.58	1.58	.01	.13	.58	1.18	1.86	3.33	4.86	6.42	7.99	9.56	9.80
39	I	.03	.10	.65	.98	1.19	1.52	1.70	1.74	---	---	1.76	0	.02	.20	.63	1.21	2.57	4.19	5.91	---	---	6.52
1	I	.03	.31	1.12	1.43	1.58	1.68	1.72	1.76	1.76	---	1.76^{e}	.02	.03	.42	1.08	1.83	3.46	5.13	6.85	---	---	8.00
2	I	.05	.52	1.13	1.41	1.51	1.58	1.62	1.63	1.65	1.68	1.68	0	.07	.49	1.14	1.87	3.42	5.02	6.64	8.28	9.93	11.53
	W	1.47	1.60	1.63	1.65	1.66	1.68	1.68	---	---	---	1.68	.17	.56	1.36	2.18	3.01	4.68	6.37	---	---	---	6.51
38	I	.08	.11	.30	.76	1.09	1.45	1.60	1.65	1.69	1.69	1.69^{e}	.01	.03	.13	.39	.86	2.16	3.69	5.30	---	---	8.34
37	I	0	.04	.62	1.26	1.46	1.64	1.71	1.76	1.76	---	1.76	0	0	.12	.63	1.32	2.88	4.56	6.29	8.04	---	8.07
6	I	.04	.28	1.05	1.17	1.27	1.38	1.46	1.52	1.54	---	1.54	.01	.03	.43	.99	1.61	2.94	4.37	5.86	7.40	---	7.42
	W	.71	1.34	1.42	1.43	1.45	1.48	1.50	1.53	1.55	---	1.55	.03	.34	1.03	1.74	2.46	3.93	5.42	6.93	8.47	---	8.81
5	I	.02	.17	1.12	1.34	1.42	1.51	1.56	1.58	1.64	1.67	1.67	0	.02	.39	1.01	1.70	3.18	4.71	6.28	7.89	9.54	10.56
	W	.70	1.47	1.55	1.58	1.60	1.64	1.67	---	---	---	1.67	.04	.37	1.13	1.91	2.70	4.33	5.98	---	---	---	6.80
7	I	.02	.59	.97	1.07	1.13	(8)	---	---	---	---	---	0	.05	.47	.97	1.52	---	---	---	---	---	1.71
	1W	.20	1.14	1.30	1.35	1.36	1.36	1.40	1.41	---	---	1.41	.01	.23	.84	1.50	2.20	3.55	4.95	6.36	---	---	7.28
	2W	1.20	1.43	1.50	1.55	1.56	1.61	1.67	1.68	1.69	---	1.69^{e}	.06	.42	1.15	1.91	2.69	4.28	5.92	7.60	---	---	8.75
8	I	.03	.09	.39	.83	.99	1.12	1.17	1.21	1.29	1.41	1.48	0	.01	.11	.44	.90	1.97	3.12	4.31	5.57	6.92	8.21
	W	.32	1.58	1.65	1.66	1.71	---	---	---	---	---	1.71	.02	.33	1.13	1.96	2.81	---	---	---	---	---	3.64
9	I	.07	.15	.21	.23	.28	.83	1.31	1.52	1.58	1.65	1.65	.01	.04	.12	.24	.36	.86	1.96	3.38	4.94	6.55	8.12
	W	.70	1.41	1.55	1.57	1.58	1.60	1.62	1.63	---	---	1.63	.06	.35	1.11	1.89	2.67	4.26	5.87	7.50	---	---	8.34
10	I	.02	.20	.35	.50	.72	1.12	1.43	1.64	1.70	---	1.70^{e}	0	.03	.17	.34	.67	1.59	2.88	4.44	---	---	5.82
	W	1.10	1.56	1.68	1.70	1.70	1.71	---	---	---	---	1.71^{e}	.08	.43	1.26	---	---	---	---	---	---	---	4.58
11	I	0	0	0	.02	.03	.14	1.20	1.55	1.66	1.70	1.70	0	0	0	0	.01	.07	.46	1.77	3.36	5.05	5.50
	W	.20	1.55	1.68	1.72	1.73	1.74	---	---	---	---	1.74	.01	.23	1.06	1.93	2.79	4.52	---	---	---	---	5.23
12	I	0	0	0	.02	.02	.76	1.52	1.66	1.68	---	1.68	0	0	0	0	0	.24	1.49	3.09	4.76	---	5.80
	W	.15	1.60	1.69	1.71	1.72	1.72	---	---	---	---	1.72^{e}	0	.29	1.12	1.97	2.83	---	---	---	---	---	4.24
13	I	.17	.28	.41	.52	.73	1.14	1.32	1.43	1.49	1.49	1.49^{e}	.02	.07	.24	.49	.79	1.75	2.99	4.37	5.82	---	7.24
	W	.77	1.31	1.48	1.51	1.51	1.52	---	---	---	---	1.52	.07	.35	1.06	1.80	2.56	4.09	---	---	---	---	4.72
14	I	.01	.59	.94	1.05	1.10	1.17	1.24	1.33	1.41	1.45	1.56	0	.07	.48	.98	1.52	2.66	3.86	5.15	6.53	7.95	12.73
	W	1.34	1.47	1.57	1.58	1.59	1.60	---	---	---	---	1.60^{e}	.14	.50	1.26	2.05	2.85	---	---	---	---	---	4.05
15	I	.56	1.15	1.34	1.40	1.42	1.42	1.42	---	---	---	1.42	.04	.27	.92	1.62	2.30	3.72	5.14	---	---	---	5.45
	W	1.45	1.52	1.54	1.54	1.54	---	---	---	---	---	1.54	.22	.60	1.36	2.13	2.90	---	---	---	---	---	3.24
16	I	.82	1.25	1.37	1.39	1.41	1.41	1.41	---	---	---	1.41	.05	.33	.99	1.68	2.38	3.80	5.21	---	---	---	5.33
	W	1.32	1.39	1.41	1.41	1.41	1.41	---	---	---	---	1.41^{e}	.19	.53	1.24	1.94	2.64	---	---	---	---	---	3.80

[1] I = initial run; W = wet run.

[2] Total runoff was tabulated from mass curve of runoff and does not include surface storage.

[3] No data; motor trouble throughout runs.

[4] No data; leaking weir.

[5] Exponent ^{e} denotes estimated rate.

[6] Second storm.

[7] Trace of runoff.

[8] Test incomplete; out of water.

TABLE 8.--Rate and volume of infiltration at various increments of time from start of infiltrometer run as measured by type "F" infiltrometer

Plot No. and run[1]		Rate of infiltration											Accumulated infiltration[2]						Volume depressions	Surface storage[3]
		Minutes from start										Final rate	Minutes from start							
		15	30	60	90	120	180	240	300	360	420		30	60	90	120	150	180		
		In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In.	In.	In.	In.	In.	In.	In.	In.
7	I	0.83	0.68	0.61	0.60	---	---	---	---	---	---	[4] 0.60^{e}	0.46	0.78	1.07^{e}	1.31^{e}	1.53^{e}	1.72^{e}	0.10	0.21
	W	.41	.25	.25	---	---	---	---	---	---	---	.25^{e}	---	---	---	---	---	---	.10	.21
8	I	.50	.34	.255	---	---	---	---	---	---	---	.25	.36	.51	.65^{e}	.77^{e}	.88^{e}	1.00^{e}	.14	.33
	W	.32	.23	.23	---	---	---	---	---	---	---	.23	---	---	---	---	---	---	.14	.335
2	I	1.02	.61	.34	.23	---	---	---	---	---	---	.22	.57	.80	.94	1.04^{e}	1.14^{e}	1.23^{e}	.025	.095
	W	.29	.22	.19	---	---	---	---	---	---	---	.19^{e}	---	---	---	---	---	---	.025	.095
1	I	.93	.49	.28	---	---	---	---	---	---	---	.28^{e}	.44	.65^{e}	.73^{e}	.78^{e}	.83^{e}	.85^{e}	.025	.095
	W	.10	.09	.09	---	---	---	---	---	---	---	.09^{e}	---	---	---	---	---	---	---	---
	2W	.09	.06	---	---	---	---	---	---	---	---	.06^{e}	---	---	---	---	---	---	.025	.095
5	I	1.25	.75	.22	.16	---	---	---	---	---	---	.16^{e}	.63	.85	.93^{e}	1.00^{e}	1.06^{e}	1.10^{e}	.08	.018
	W	.60	.25	.225	---	---	---	---	---	---	---	.225^{e}	---	---	---	---	---	---	.08	.018
6	I	1.30	.83	.40	.375	---	---	---	---	---	---	.375	.65	.93	1.11^{e}	1.27^{e}	1.41^{e}	1.55^{e}	.09	.205
	W	.49	.30	.22	---	---	---	---	---	---	---	[5] .15^{e}	---	---	---	---	---	---	.09	.225
9	I	1.09	.76	.47	.44	---	---	---	---	---	---	.44^{e}	.58	.88	1.09^{e}	1.25^{e}	1.40^{e}	1.52^{e}	.06	.145
	W	.46	.36	.15	---	---	---	---	---	---	---	[5] .12	---	---	---	---	---	---	.06	.15
10A	I	[6] ---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	W	.21	.03	.005	---	---	---	---	---	---	---	.005	---	---	---	---	---	---	.14	.28
13	I	1.50	1.28	.91	.67	.51	.50	---	---	---	---	.50^{e}	.75	1.29	1.68	1.98	2.22^{e}	2.40^{e}	.05	.145
	W	.57	.29	.10	0.^{e}	---	---	---	---	---	---	.12	---	---	---	---	---	---	.05	.145
14	I	.93	.50	.465	---	---	---	---	---	---	---	.465^{e}	.52	.73^{e}	.93^{e}	1.12^{e}	1.29^{e}	1.45^{e}	.05	.13
	W	.36	.34	.34	---	---	---	---	---	---	---	.34	---	---	---	---	---	---	.05	.135
15	I	1.22	.86	.46	.33	.32	---	---	----	---	---	.32^{e}	.60	.93	1.13	1.30^{e}	1.44^{e}	1.57^{e}	.055	.11
	W	.59	.41	.27	---	---	---	---	---	---	---	.27^{e}	---	---	---	---	---	---	.055	.11
16	I	1.31	1.09	.73	.52	.49	---	---	---	---	---	.49^{e}	.66	1.12	1.43	1.70	1.93^{e}	2.15^{e}	.08	.13
	W	.59	.45	.40	---	---	---	---	---	---	---	.40^{e}	---	---	---	---	---	---	.08	.135
12	I	1.47	1.22	1.00	.84	.55	.06	---	---	---	---	.03	.74	1.27	1.75	2.10	2.30	2.38	.07	.26
	W	.07	.05	.035	---	---	---	---	---	---	---	.035	---	---	---	---	---	---	.07	.27
11	I	1.745	1.72	1.70	1.59	1.03	.27	.22	---	---	---	.22^{e}	.86	1.73	2.54	3.16	3.55	3.73	.085	.295
	W	.57	.02	.02	---	---	---	---	---	---	---	.02	---	---	---	---	---	---	.085	.31
1	I	1.15	.94	.62	.36	0.24	.20	---	---	---	---	.20^{e}	.60	.99	1.23	1.37	1.48	1.57^{e}	.07	.125
	W	.21	.18	.18	---	---	---	---	---	---	---	.18	---	---	---	---	---	---	.07	.13
2	I	1.18	.88	.46	.28	.24	---	---	---	---	---	.22	.62	.94	1.12	1.26	1.37^{e}	1.47^{e}	.045	.125
	W	.49	.38	.35	.35	---	---	---	---	---	---	[5] .17	---	---	---	---	---	---	.045	.125
5	I	1.35	.91	.47	.30	.28	---	---	---	---	---	.28	.68	1.01	1.20	1.33	1.48^{e}	1.62^{e}	.12	.23
	W	.89	.70	.51	---	---	---	---	---	---	---	[5] .38	---	---	---	---	---	---	.12	.205
6	I	1.46	1.10	.65	.49	.33	---	---	---	---	---	.33	.73	1.15	1.43	1.64	1.73^{e}	1.93^{e}	.175	.29
	W	.77	.53	.40	.29	.28	---	---	---	---	---	.28	---	---	---	---	---	---	.175	.30
7	I	1.18	.83	.58	.52	.49	---	---	---	---	---	.49	.62	.98	1.25	1.49	1.73^{e}	1.95^{e}	.105	.20
	W	.63	.45	.41	---	---	---	---	---	---	---	.41	---	---	---	---	---	---	.105	.205
8	I	1.45	1.22	.90	.66	.54	---	---	---	----	---	.52	.74	1.26	1.65	1.95	2.22^{e}	2.45^{e}	.16	.29
	W	.86	.49	.39	---	---	---	---	---	---	---	.39	---	---	---	---	---	---	.16	.305
9	I	1.65	1.39	1.04	.93	.86	.83	---	---	---	---	.83^{e}	.83	1.42	1.90	2.35	2.78	3.17^{e}	.11	.18
	W	1.43	1.16	.76	.55	---	---	---	---	---	---	[5] .18	---	---	---	---	---	---	.11	.19
10	I	1.24	1.09	1.00	.96	.91	.69	.36	---	---	---	.36	.63	1.15	1.64	2.10	2.54	2.93	.055	.20
	W	.76	.41	.14	.05	.04	---	---	---	---	---	.04	---	---	---	---	---	---	.055	.205
11	I	1.74	1.69	1.54	1.30	.76	.23	---	---	---	---	.21	---	1.70	2.40	2.95	3.21	3.35	.125	.33
	W	.54	.27	.17	.17	---	---	---	---	---	---	.17^{e}	---	---	---	---	---	---	.125	.335
12	I	1.74	1.68	1.49	1.25	.88	.32	.22	---	---	---	.22^{e}	.87	1.68	2.38	2.92	3.26	3.47	.09	.28
	W	.52	.14	.12	.12	---	---	---	---	---	---	.12^{e}	---	---	---	---	---	---	.09	.28
13	I	1.57	1.47	1.33	1.24	1.09	.76	.43	.33	---	---	.33^{e}	.80	1.50	2.15	2.73	3.22	3.64	.11	.20
	W	.53	.35	.25	.25	---	---	---	---	---	---	.25^{e}	---	---	---	---	---	---	.115	.21
14	I	1.38	1.13	.81	.59	.50	.44	.42	---	---	---	.42	.70	1.12	1.42	1.68	1.92	2.15	.07	.16
	W	.71	.61	.54	.50	---	---	---	---	---	---	[5] .28	----	---	---	---	---	---	.07	.16
15	I	1.32	.99	.57	.41	.38	---	---	---	---	---	.38	.66	1.05	1.29	1.48	1.62	1.76	.075	.14
	W	.50	.40	.37^{e}	[6] .24	---	---	---	---	---	---	[5] .24	---	---	---	---	---	---	.075	.14
16	I	1.58	1.20	.68	.51	.44	.32	---	---	---	---	.32	.78	1.23	1.53	1.76	1.95	2.12	.055	.12
	W	.50	.41	.35	---	---	---	---	---	---	---	.35	---	---	---	---	---	---	.055	.12

TABLE 8.--Continued

Plot No. and run[1]		Rate of infiltration											Accumulated infiltration[2]						Volume depres-sions	Surface storage[3]
		Minutes from start										Final rate	Minutes from start							
		15	30	60	90	120	180	240	300	360	420		30	60	90	120	150	180		
		In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In//hr.	In./hr.	In./hr.	In./hr.	In.	In.	In.	In.	In.	In.	In.	In.
2	I	1.56	1.19	.59	.39	.28	.21	---	---	---	---	.21[e]	.79	1.20	1.45	1.60	1.72	1.83	.065	.14
	W	.37	.24	.21	.19	---	---	---	---	---	---	.19	---	---	---	---	---	---	.065	.14
1	I	1.48	1.13	.60	.34	.22	.15	---	---	---	---	.15	.74	1.18	1.41	1.55	1.65	1.73	.03	.12
	W	.19	.11	.09	.09	---	---	---	---	---	---	.09[e]	---	---	---	---	---	---	.03	.125
5	I	1.55	1.24	.71	.44	.36	---	---	---	---	---	.36	.78	1.27	1.53	1.74	1.91	2.05	.155	.27
	W	.82	.45	.285	.28	.28	---	---	---	---	---	.28[e]	---	---	---	---	---	---	.155	.27
6	I	1.76	1.67	1.22	.87	.70	.575	---	---	---	---	.575[e]	.85	1.62	2.12	2.52	2.85	3.13[e]	.075	.185
	W	1.07	.65	.55	.52	.50	.50	---	---	---	---	.50[e]	---	---	---	---	---	---	.075	.19
7	I	1.53	1.32	1.04	.82	.67	.51	.465	---	---	---	.465[e]	.77	1.36	1.84	2.21	2.51	2.78	.095	.205
	W	.85	.62	.51	.45	.45	---	---	---	---	---	.45[e]	---	---	---	---	---	---	.095	.205
8	I	1.59	1.43	1.17	.95	.77	.57	.55	---	---	---	.55[e]	.78	1.44	1.98	2.40	2.75	3.05	.12	.255
		.90	.64	.45	.42	.42	---	---	---	---	---	.42[e]	---	---	---	---	---	---	.12	.255
9	I	1.75	1.66	1.47	1.27	1.14	1.085	---	---	---	---	1.085	.88	1.67	2.34	2.92	3.48	4.00	[7] .06	.12
		1.48	1.22	.85	.70	.575	.35	.32	---	---	---	.32[e]	---	---	---	---	---	---	.10	.20
10	I	1.55	1.30	1.09	.92	.73	.38	.17	.07	.06	---	.06[e]	.75	1.35	1.88	2.30	2.60	2.83	.105	.255
	W	.38	.19	.07	.08	---	---	---	---	---	---	.08[e]	---	---	---	---	---	---	.105	.25
11	I	1.825	1.81	1.78	1.52	.78	.24	.17	---	---	---	.14	(8)	(8)	(8)	3.24	3.51	3.65	.08	.32
	W	.78	.21	.13	.09	.07	---	---	---	---	---	.07	---	---	---	---	---	---	.08	.32
12	I	1.83	1.83	1.79	1.12	.52	.16	---	---	---	---	.16	(8)	(8)	(8)	3.01	3.20	3.29	.03	.26
	W	.62	0	0	0	---	---	---	---	---	---	0[e]	---	---	---	---	---	---	.03	.275
13	I	1.14	.94	.72	.53	.45	.41	---	---	---	---	.41[e]	.58	1.00	1.30	1.54	1.76	1.98	.085	.16
	W	.90	.51	.22	---	---	---	---	---	---	---	.22	---	---	---	---	---	---	.085	.17
14	I	1.05	.88	.69	.57	.46	.39	---	---	---	---	.39	.55	.95	1.28	1.55	1.76	1.96	.04	.11
	W	.50	.35	.28	.28	---	---	---	---	---	---	.28[e]	---	---	---	---	---	---	.04	.12
15	I	.66	.38	.24	.22	---	---	---	---	---	---	.22	.35	.51	.62	.73	.83	.92[e]	.025	.08
	W	.26	.175	.175	---	---	---	---	---	---	---	.175[e]	---	---	---	---	---	---	.025	.085
16	I	.57	.37	.22	.17	.15	---	---	---	---	---	.15	.35	.50	.59	.69	.75[e]	.80[e]	.03	.09
	W	.26	.14	.10	---	---	---	---	---	---	---	.10	---	---	---	---	---	---	.03	.09
4	I	1.43	1.20	1.07	1.01	.96	.83	---	---	---	---	.78	.73	1.28	1.81	2.30	2.78	3.20	.19	.29
	W	.90	.82	.73	.63	.54	.525	---	---	---	---	.525[e]	---	---	---	---	---	---	.19	.295
3	I	1.53	1.18	.69	.64	.64	.64	.645	---	---	---	.645[e]	.63	1.07	1.41	1.73	2.05	2.38	.125	.22
	W	.63	.52	.50	.495	.495	---	---	---	---	---	.495	---	---	---	---	---	---	.125	.25
22	I	.97	.84	.69	.58	.51	.50	---	---	---	---	.50	.53	.90	1.22	1.50	1.75	2.00	.15	.24
	W	.83	.635	.52	.51	.51	---	---	---	---	---	.51	---	---	---	---	---	---	.15	.235
1	I	.86	.54	.285	.17	---	---	---	---	---	---	.17	.45	.65	.75	.82[e]	.87[e]	.90[e]	.04	.12
	W	.24	.09	.05	.05	---	---	---	---	---	---	.05	---	---	---	---	---	---	.04	.12
20	I	.97	.64	.425	.35	.28	.26	---	---	---	---	.26	.50	.75	.95	1.13	1.26	1.38	.055	.14
	W	.53	.33	.23	.23	---	---	---	---	---	---	.23	---	---	---	---	---	---	.055	.14
6	I	1.52	1.14	.67	.51	.42	.33	---	---	---	---	.33[e]	.75	1.18	1.49	1.70	1.89[e]	2.04[e]	.15	.275
	W	.66	.45	.36	.36	---	---	---	---	---	---	.36	---	---	---	---	---	---	.15	.275
18	I	1.50	1.30	.99	.81	.70	.62	---	---	---	---	.62	.75	1.33	1.78	2.17	2.50	2.80	.125	.23
	W	1.01	.79	.63	.56	.50	.485	---	---	---	---	.485	---	---	---	---	---	---	.125	.245
7	I	1.29	.99	.63	.52	.47	.36	.345	---	---	---	.345	.63	1.08	1.38	1.63	1.86	2.04	.09	.20
	W	.54	.31	.26	.25	.25	---	---	---	---	---	.25	---	---	---	---	---	---	.09	.20
24	I	1.175	.70	.375	.37	.37	.37[e]	---	---	---	---	.367	.58	.82	1.00	1.18	1.37	1.55[e]	.10	.17
	W	.46	.32	.32	.32	---	---	---	---	---	---	.32[e]	---	---	---	---	---	---	.10	.17
9	I	1.50	1.28	1.02	.83	.68	.55	.516	---	---	---	.516	.77	1.33	1.77	2.16	2.48	2.78	.055	.135
	W	.71	.51	.45	.39	.35	.34	---	---	---	---	.34[e]	---	---	---	---	---	---	.055	.135
26	I	.64	.38	.25	.22	.21	.21	---	---	---	---	.21[e]	.37	.52	.67	.78	.90	.99	.02	.095
	W	.35	.22	.18	---	---	---	---	---	---	---	.18	---	---	---	---	---	---	.02	.095
11	I	1.80	1.70	1.53	1.42	1.30	1.04	.57	.23	.14	.10	.10[e]	.90	1.70	2.42	3.10	3.73	4.30	.095	.355
	W	.40	.15	.085	.085	---	---	---	---	---	---	.085	---	---	---	---	---	---	.095	.355
27	I	1.73	1.665	1.56	1.46	1.39	1.325	1.20	.86	.55	.30	.29	.82	1.65	2.40	3.10	3.80	4.46	.14	.225
	W	.84	.48	.27	.235	.235	---	---	---	---	---	.23	---	---	---	---	---	---	.14	.225
13	I	1.19	1.05	.95	.86	.73	.49	.31	.295	---	---	.295[e]	.65	1.15	1.60	2.02	2.35	2.63	.066	.14
	W	.63	.37	.22	.20	.20	---	---	---	---	---	.20[e]	---	---	---	---	---	---	.066	.15

TABLE 8.--Continued

Plot No. and run[1]		Rate of infiltration											Accumulated infiltration[2]						Volume depressions	Surface storage[3]
		Minutes from start										Final rate	Minutes from start							
		15	30	60	90	120	180	240	300	360	420		30	60	90	120	150	180		
		In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In.	In.	In.	In.	In.	In.	In.	In.
29	I	.435	.27	.22	.19	.19	.19	---	---	---	---	.19^{e}	.29	.40	.52	.62	.72	.80^{e}	.025	.07
	W	.13	.12	.12	.12	.12	---	---	---	---	---	.12^{e}	---	---	---	---	---	---	.025	.07
16	I	.45	.26	.17	.165	.165	---	---	---	---	---	.165	.29	.40	.48	.56	.63^{e}	.69^{e}	.025	.08
	W	.20	.13	.13	---	---	---	---	---	---	---	.13	---	---	---	---	---	---	.025	.08
32	I	.95	.63	.44	.38	.335	.32	---	---	---	---	.32	.51	.76	.98	1.18	1.35	1.50	.06	.145
	W	.315	.225	.225	.225	---	---	---	---	---	---	.225^{e}	---	---	---	---	---	---	.06	.15
2	I	.95	.72	.60	---	---	---	---	---	---	---	.60^{e}	.53	.85	1.08	1.30	1.37^{e}	1.47^{e}	.045	.11
	W	.575	.41	.33	.295	.295	---	---	---	---	---	.295^{e}	---	---	---	---	---	---	.045	.12
17	I	1.20	.57	.32	.32	---	---	---	---	---	---	.32	.60	.79	.95	1.10	1.20	1.29	.095	.195
	W	.38	.22	.17	---	---	---	---	---	---	---	.17	---	---	---	---	---	---	.095	.20
4	I	1.69	1.59	1.39	1.19	.98	.62	.48	---	---	---	.48	.78	1.54	2.23	2.81	3.28	3.62	.18	.28
	W	1.01	.59	.35	.345	---	---	---	---	---	---	.345^{e}	---	---	---	---	---	---	.18	.30
21	I	1.335	1.10	.89	.81	.765	.685	.68	---	---	---	.68	.70	1.20	1.63	2.03	2.40	2.74	[7] .025	.075
	W	.93	.71	.58	.53	.48	.475	---	---	---	---	.475^{e}	---	---	---	---	---	---	.08	.145
19	I	1.73	1.68	1.58	1.45	1.35	1.12	.935	.88	---	---	.88^{e}	.88	1.70	2.45	3.18	3.83	4.43	.175	.255
	W	1.19	.93	.795	.795	.795	---	---	---	---	---	.795^{e}	---	---	---	---	---	---	.175	.26
5	I	1.46	1.23	.88	.62	.44	.365	---	---	---	---	.365^{e}	.75	1.27	1.61	1.87	2.07	2.24^{e}	.11	.255
	W	.725	.375	.23	.18	.16	.16	---	---	---	---	.16^{e}	---	---	---	---	---	---	.11	.235
33	I	1.75	1.62	1.37	1.10	.83	.45	.33	.29	---	---	.29	.88	1.65	2.25	2.75	3.07	3.32	.29	[9] .52
	W	.82	.46	.29	.25	.23	---	---	---	---	---	.23	---	---	---	---	---	---	.29	.525
8	I	.87	.755	.65	.54	.48	.455	---	---	---	---	.455	.47	.83	1.13	1.39	1.62	1.85	.135	.305
	W	.585	.34	.255	.24	---	---	---	---	---	---	.24	---	---	---	---	---	---	.135	.33
25	I	1.03	.82	.72	.66	.63	.625	---	---	---	---	.625	.57	.95	1.28	1.60	1.92	2.23	.17	.355
	W	.74	.50	.45	.45	---	---	---	---	---	---	.45^{e}	---	---	---	---	---	---	.17	.37
12	I	1.50	1.39	1.17	1.09	.99	.73	.48	.30	.18	.10	.08	.77	1.39	1.94	2.46	2.94	3.35	.05	.25
	W	.26	.05	.05	.05	---	---	---	---	---	---	.05	---	---	---	--	---	---	.045	.245
23	I	1.02	.91	.825	.81	.80	.735	.735	---	---	---	.735	.55	.98	1.40	1.80	2.19	2.57	.075	.17
	W	.68	.47	.38	.38	---	---	---	---	---	---	.38^{e}	---	---	---	---	---	---	.075	.18
	2W	.73	.51	.39	.33	.33	---	---	---	---	---	.33^{e}	---	---	---	---	---	---	.075	.19
10	I	.74	.71	.65	.60	.56	.44	.27	.265	---	---	.265^{e}	.43	.77	1.08	1.35	1.61	1.84	.06	.185
	W	.34	.28	.24	.20	.185	---	---	---	---	---	.185	---	---	---	---	---	---	.06	.19
28	I	1.06	.89	.82	.79	.77	.71	.52	.35	.32	---	.32^{e}	.57	1.00	1.42	1.80	2.19	2.54	.06	.18
	W	.53	.37	.22	.14	.14	---	---	---	---	---	.14^{e}	---	---	---	---	---	---	.06	.19
14	I	.76	.66	.57	.52	.49	.40	.325	.325	---	---	.325^{e}	.43	.73	1.01	1.26	1.50	1.70	.045	.13
	W	.32	.19	.14	.14	.14	---	---	---	---	---	.14^{e}	---	---	---	---	---	---	.045	.14
30	I	.63	.43	.35	.35	.35	---	---	---	---	---	.35	.38	.57	.75	.93	1.10	1.25	.055	.13
	W	.15	.11	.11	---	---	---	---	---	---	---	.11	---	---	---	---	---	---	.055	.14
15	I	.25	.125	.125	.125	---	---	---	---	---	---	.125	.18	.25	.31	.36^{e}	.40^{e}	.42^{e}	.02	.095
	W	.08	.05	.05	---	---	---	---	---	---	---	.05	---	---	---	---	---	---	.02	.10
31	I	.41	.28	.235	.23	.23	---	---	---	---	---	.23^{e}	.27	.40	.52	.63	.74	.83^{e}	.015	.10
	W	.23	.19	.19	---	---	---	---	---	---	---	.19	---	---	---	---	---	---	.015	.10
31A	I	.76	.57	.38	.34	.34	---	---	---	---	---	.34	.42	.66	.85	1.03	1.20^{e}	1.37^{e}	.075	.14
	W	.76	.58	.33	---	---	---	---	---	---	---	[5] .16	---	---	---	---	---	---	.075	.14
1	I	.99	.43	.13	.11	.11	.11	---	---	---	---	.11^{e}	.50	.62	.68	.74	.80	.86	.02	.09
6	I	1.01	.69	.35	.13	.11	---	---	---	---	---	.11	.53	.78	.91	.97^{e}	1.07^{e}	1.08^{e}	---	---
3	I	1.46	1.11	.54	.24	.15	.127	---	---	---	---	.127^{e}	.72	1.12	1.31	1.40	1.47	1.53^{e}	.14	.26
7	I	1.00	.64	.29	.18	.14	.07	.07	---	---	---	.07^{e}	.52	.74	.84	.94	1.02	1.06	.01	.165
9	I	1.18	.96	.63	.34	.24	.18	.18	---	---	---	.18	.62	1.03	1.20	1.33	1.46	1.55	.055	.17
11	I	1.66	1.26	.34	.08	.05	.015	---	---	---	---	.015	.79	1.16	1.24	1.27	1.285	1.29	.055	.315
13	I	1.47	1.12	.56	.385	.385	.385	---	---	---	---	.385^{e}	.72	1.15	1.42	1.56	1.75	1.94^{e}	.05	.135
34	I	1.26	.97	.70	.66	.66	.66	---	---	---	---	.66	.63	1.04	1.38	1.71	2.05	2.38	.10	.175
16	I	1.30	.94	.61	.36	.26	.18	.18	---	---	---	.18	.65	1.03	1.27	1.42	1.54	1.62	.015	.07
42	I	1.25	.79	.47	.30	.14	.034	---	---	---	---	.034^{e}	.65	.95	1.15	1.26	1.31	1.33^{e}	.03	.20
44	I	1.07	1.00	.92	.74	.65	.51	.44	.36	.36	.27	[5] .27^{e}	.55	1.03	1.45	1.79	2.10	2.37	.25	.40
50	I	.89	.65	.47	.42	.36	.19	.14	---	---	---	[5] .08	.48	.74	.95	1.15	1.29	1.40	.05	.25
48	I	.89	.71	.55	.45	.42	.335	.335	---	---	---	.335^{e}	.45	.76	1.01	1.24	1.45	1.63	.08	.235

TABLE 8.--Continued

Plot No. and run[1]		Rate of infiltration										Accumulated infiltration[2]							Volume depressions	Surface storage[3]
		Minutes from start										Final rate	Minutes from start							
		15	30	60	90	120	180	240	300	360	420		30	60	90	120	150	180		
		In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In./hr.	In.	In.	In.	In.	In.	In.	In.	In.
46	I	1.04	.76	.56	.44	.35	.22	.21	---	---	---	.21	.56	.88	1.13	1.33	1.48	1.59	.04	.175
47	I	1.47	1.26	.86	.55	.34	.13	.08	---	---	---	.08	.75	1.28	1.62	1.85	1.98	2.07	.05	.25
49	I	1.09	.81	.65	.57	.52	.41	.32	.26	.25	---	.25^{e}	.57	.94	1.25	1.53	1.78	2.00	.03	.24
51	I	1.23	.95	.59	.43	.36	.26	.23	.21	---	---	[5] .17	.62	1.00	1.25	1.45	1.61	1.73	.035	.175
53	I	1.70	1.53	.62	.35	.24	.20	.18	---	---	---	.18	.84	1.37	1.61	1.76	1.86	1.94	.11	.325
52	I	1.65	1.54	1.37	1.14	.70	.24	.19	.16	.14	---	.14	.81	1.52	2.16	2.64	2.90	3.07	.10	.30
45	I	.77	.60	.53	.50	.49	.46	.39	.25	.16	.09	.09^{e}	.42	.70	.95	1.19	1.45	1.69	.015	.10
	W	.33	.22	.14	.09	.07	.05	---	---	---	---	.05	---	---	---	---	---	---	.015	.11
43	I	1.61	1.55	1.45	1.36	1.30	.96	.58	.35	.24	.175	.13	.78	1.53	2.26	2.92	3.55	4.09	.09	.25
35	I	1.31	.84	.53	.32	.26	.20	.15	.11	.075	---	[5] .04	.66	.99	1.21	1.37	1.51	1.63	.04	.125
36	I	1.69	1.55	1.28	.98	.79	.54	.37	.27	.18	.11	[5] .07^{e}	.81	1.54	2.11	2.56	2.92	3.20	.09	.275
41	I	1.68	1.56	1.28	.98	.78	.72	.67	.57	.43	.29	.115	.83	1.56	2.11	2.56	2.94	3.27	.13	.325
4	I	1.78	1.74	1.46	1.04	.52	.27	.21	.18	.15	.15	.15	.88	1.70	2.33	2.71	2.92	3.07	.09	.225
	W	.59	.30	.20	.18	.16	.12	.10	.10	---	---	.10^{e}	---	---	---	---	---	---	.10	.25
3	I	1.77	1.69	1.40	1.01	.62	.30	.21	.16	.13	.10	.09	.88	1.67	2.25	2.66	2.91	3.06	.15	.34
	W	.54	.20	.13	.13	.125	.12	.12	---	---	---	.12^{e}	---	---	---	---	---	---	.15	.34
40	I	1.32	1.02	.65	.46	.32	.25	.23	.21	.19	.19	.19	.67	1.09	1.38	1.57	1.72	1.84	.05	.13
39	I	1.70	1.49	.89	.70	.56	.24	.05	.02	---	---	.02	.85	1.44	1.83	2.16	2.40	2.55	.06	.24
1	I	1.62	1.25	.61	.33	.17	.08	.05	.02	.01	---	.01^{e}	.80	1.25	1.48	1.60	1.68	1.70	.035	.14
2	I	1.50	1.16	.63	.30	.28	.20	.17	.15	.13	.11	.11	.75	1.20	1.44	1.59	1.71	1.80	.035	.125
	W	.24	.15	.12	.10	.09	.09	.09	---	---	---	.09	---	---	---	---	---	---	.035	.125
38	I	1.65	1.55	1.33	.95	.63	.34	.18	.12	.08	.08	.08^{e}	.82	1.56	2.14	2.52	2.78	2.96	.05	.185
37	I	1.74	1.57	.92	.47	.28	.12	.05	.02	.01	---	.01	.88	1.52	1.84	2.03	2.14	2.20	.03	.245
6	I	1.48	1.13	.71	.56	.48	.39	.32	.27	.24	---	.24	.75	1.19	1.52	1.78	2.02	2.20	.07	.22
	W	.50	.41	.36	.34	.32	.30	.27	.24	.225	---	.225	---	---	---	---	---	---	.07	.22
5	I	1.57	1.15	.60	.44	.35	.26	.23	.19	.15	.12	.11	.79	1.20	1.45	1.65	1.82	1.93	.09	.225
	W	.46	.30	.23	.21	.18	.14	.12	---	---	---	.116	---	---	---	---	---	---	.09	.225
7	I	1.32	1.00	.82	.72	.65	(10)	---	---	---	---	---	.68	1.12	1.49	1.83	2.09^{e}	2.32^{e}	.12	.22
	W	.83	.65	.47	.42	.42	.41	.39	.37	---	---	.37	---	---	---	---	---	---	.12	.23
	2W	.47	.34	.28	.25	.22	.17	.12	.10	---	---	.10	---	---	---	---	---	---	.12	.24
8	I	1.64	1.48	1.17	.91	.78	.66	.60	.54	.47	.35	.30	.82	1.50	2.01	2.43	2.78	3.09	.11	.29
	W	.40	.07	.05	.05	.05	---	---	---	---	---	.05	---	---	---	---	---	---	.11	.31
9	I	1.65	1.57	1.51	1.49	1.43	.92	.46	.26	.18	.13	.12	.82	1.60	2.35	3.08	3.79	4.30	.06	.16
	W	.66	.32	.22	.20	.19	.16	.15	.14	---	---	.14	---	---	---	---	---	---	.06	.16
10	I	1.65	1.55	1.39	1.23	1.04	.64	.32	.125	.075	---	.075^{e}	.80	1.54	2.20	2.78	3.25	3.61	.003	.175
	W	.34	.19	.10	.065	.065	.065	---	---	---	---	.065^{e}	---	---	---	---	---	---	.003	.175
11	I	(11)	(11)	(11)	(11)	(11)	1.38	.53	.24	.11	.09	.09	(12)	(12)	(12)	(12)	(12)	5.25	.08	.28
	W	.50	.12	.08	.07	.06	.05	---	---	---	---	.05	---	---	---	---	---	---	.08	.28
12	I	(11)	(11)	(11)	(11)	1.78^{e}	.88	.26	.12	.10	---	.10	(12)	(12)	2.64	3.50	4.35	4.96	.055	.21
	W	.53	.11	.09	.075	.075	.075	---	---	---	---	.075^{e}	---	---	---	---	---	---	.055	.21
13	I	1.59	1.47	1.35	1.23	1.03	.65	.46	.33	.29	.29	.29^{e}	.78	1.47	2.12	2.69	3.14	3.50	.04	.125
	W	.81	.46	.31	.27	.255	.255	---	---	---	---	.255	---	---	---	---	---	---	.04	.125
14	I	1.51	1.15	.83	.74	.67	.61	.55	.45	.38	.33	.22	.71	1.18	1.58	1.94	2.28	2.57	.045	.155
	W	.40	.28	.20	.18	.175	.175	---	---	---	---	.175^{e}	---	---	---	---	---	---	.045	.155
15	I	.95	.56	.42	.36	.35	.34	.34	---	---	---	.34	.53	.76	.97	1.14	1.31	1.46	.04	.09
	W	.34	.26	.24	.24	.24	---	---	---	---	---	.24	---	---	---	---	---	---	.04	.09
16	I	.83	.56	.43	.39	.39	.39	.39	---	---	---	.39	.48	.72	.91	1.11	1.32	1.50	.05	.10
	W	.43	.375	.37	.37	.37	.37	---	---	---	---	.37^{e}	---	---	---	---	---	---	.05	.10

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[1] I = initial run; W = wet run.
[2] Data for initial run only.
[3] Surface storage includes retention and detention.
[4] Exponent ^{e} denotes estimated rate.
[5] Second storm.
[6] Data invalid; weir leaking.
[7] Incomplete.
[8] Rainfall.
[9] False terraine.
[10] Data incomplete; out of water.
[11] Data invalid; totals greater than rainfall.
[12] Data invalid; equals rainfall.

TABLE 9.--Visual estimates of the basal area of vegetation (relative values for statistical analysis purposes), March 25, 1941

Plot No.	Percentage plot area covered	Plot No.	Percentage plot area covered	Plot No.	Percentage plot area covered	Plot No.	Percentage plot area covered
1	20	10-A	100	18	60	27	100
2	15	10	100	19	60	28	60
3	60	11	95	20	25	29	5
4	80	12	95	21	50	30	85
5	30	13	70	22	90	31-A	5
6	30	14	75	23	100	31	5
7	[1] 10	15	5	24	20	32	40
8	75	16	5	25	50	33	40
9	95	17	20	26	5	34	80

[1] Plot 7 was badly trampled by stock during the winter. Estimate of cover density before trampling is the same as for plot 8.

TABLE 10.--Vegetative canopy on plots used in infiltrometer runs on watersheds I and II at Edwardsville, Ill., for period May 7, 1940, to July 24, 1941

Plot No.	Run No.	Date	Type of vegetation and percentage of plot area canopied[1]
		1940	
7	1	May 7	Lespedeza, 29%; timothy, 24%; wild grass, 18%; sweetclover, 6%; weeds, 2%; dead vegetation, 21%.
8	1	May 7	Timothy, 32%; wild grasses, 24%; dead vegetation, 4%.
2	1	May 16	Alfalfa, approx. 100%; very few weeds.
1	1	May 16	Alfalfa, approx. 100%; very few weeds.
5	1	May 21	Alfalfa, approx. 80%; weeds and grasses, 10%; no vegetation, 10%.
6	1	May 21	Alfalfa, approx. 90%; weeds, 10%.
9	1	May 24	Kentucky bluegrass, 43%; wild grasses, 21%; white clover, 5%; weeds, 10%; dead vegetation, 21%.
10A	1	May 24	Kentucky bluegrass, 47%; wild grasses, 20%; weeds, 8%; white clover, 3%; dead vegetation, 22%.
13	1	May 24	Kentucky bluegrass, 22%; wild grasses, 8%; weeds, 45%; white clover, 4%; dead vegetation, 21%.
14	1	May 24	Kentucky bluegrass, 29%; timothy, 1%; wild grasses, 16%; white clover, 3%; yellow clover, 1%; weeds, 26%; dead vegetation, 24%.
15	1	May 29	Lespedeza, 50%; bluegrass, 8%; wild grasses, 8%; yellow sweetclover, 3%; weeds, 15%; moss, 7%; no vegetation, 9%.
16	1	May 29	Lespedeza, 31%; weeds, 34%; wild grasses, 8%; yellow sweetclover, 1%; dead vegetation, 21%; no vegetation, 5%.
12	1	June 4	Kentucky bluegrass, 50%; timothy, 11%; white clover, 3%; wild grasses, 6%; weeds, 16%; dead vegetation, 14%.
11	1	June 6	Kentucky bluegrass, 38%; timothy, 9%; red clover, 1%; wild grasses, 9%; weeds, 23%; dead vegetation, 20%.
1	2	June 15	Alfalfa, 58%; dead vegetation, 19%; no vegetation, 23%.
2	2	June 16	Alfalfa, 62%; dead vegetation, 22%; no vegetation, 16%.
5	2	June 18	Alfalfa, 47%; dead vegetation, 22%; wild grass, 12%; weeds, 8%; lespedeza, 6%; red clover, 1%; and no vegetation, 4%.
6	2	June 18	Alfalfa, 45%; lespedeza, 9%; red clover, 5%; wild grasses, 8%; weeds, 7%; moss, 3%; dead vegetation, 18%; no vegetation, 5%.
7	2	June 24	Timothy, 24%; redtop, 12%; Kentucky bluegrass, 4%; lespedeza, 27%; white clover, 1%; weeds, 25%; dead vegetation, 7%.
8	2	June 24	Redtop, 30%; timothy, 27%; lespedeza, 6%; sweetclover, 3%; white clover, 1%; weeds, 10%; no vegetation, 4%; dead vegetation, 19%.
9	2	June 26	Kentucky bluegrass, 32%; wild grasses, 9%; white clover, 12%; redtop, 6%; timothy, 2%; lespedeza, 2%; weeds, 21%; dead vegetation, 16%.
10	1	June 26	Kentucky bluegrass, 22%; redtop, 12%; wild grasses, 31%; white clover, 5%; weeds, 21%; dead vegetation, 9%.
11	2	July 6	Kentucky bluegrass, 63%; redtop, 5%; timothy, 2%, wild grasses, 2%; dewberry, 21%; other weeds, 5%; dead vegetation, 2%.
12	2	July 1	Kentucky bluegrass, 57%; timothy, 7%; lespedeza, 9%; wild grasses, 5%; dewberry, 9%; other weeds, 9%; no vegetation, 2%; dead vegetation, 2%.
13	2	July 8	Kentucky bluegrass, 18%; timothy, 3%; lespedeza, 6%; wild grasses, 15%; dewberry, 17%; weeds, 22%; dead vegetation, 19%.
14	2	July 8	Kentucky bluegrass, 14%; timothy, 6%; wild grasses, 32%; dewberry, 14%; other weeds, 17%; no vegetation, 3%; dead vegetation, 14%.
15	2	July 9	Lespedeza, 42%; yellow clover, 4%; white clover, 1%; wild grasses, 6%; weeds, 33%; no vegetation, 7%; dead vegetation, 7%.
16	2	July 10	Kentucky bluegrass, 3%; lespedeza, 42%; wild grasses, 4%; weeds, 29%; dead vegetation, 17%; no vegetation, 5%.
2	3	July 14	Alfalfa, 62%; lespedeza, 3%; weeds, 1%; dead vegetation, 17%; no vegetation, 17%.

TABLE 10.--Continued

Plot No.	Run No.	Date	Type of vegetation and percentage of plot area canopied[1]
		1940	
1	3	July 16	Alfalfa, 81%; dead vegetation, 7%; no vegetation, 12%.
5	3	July 18	Alfalfa, 53%; wild grasses, 19%; lespedeza, 3%; weeds, 5%; dead vegetation, 20%.
6	3	July 22	Alfalfa, 50%; crabgrass, 20%; lespedeza, 14%; weeds, 6%; dead vegetation, 9%; no vegetation, 1%.
7	3	July 28	Timothy, 28%; lespedeza, 33%; wild grasses, 5%; weeds, 18%; dead vegetation, 13%; no vegetation, 3%.
8	3	July 30	Redtop, 36%; timothy, 13%; lespedeza, 9%; sweetclover, 3%; wild grasses, 11%; weeds, 2%; dead vegetation, 24%; no vegetation, 2%.
9	3	Aug. 2	Kentucky bluegrass, 38%; redtop, 4%; timothy, 2%; white clover, 3%; wild grasses, 14%; weeds, 18%; dead vegetation, 21%.
10	2	Aug. 3	Kentucky bluegrass, 35%; redtop, 1%; timothy, 1%; wild grasses, 27%; dewberry, 9%; dead vegetation, 19%; no vegetation, 8%.
11	3	Aug. 6	Kentucky bluegrass, 43%; redtop, 2%; timothy, 4%; lespedeza, 7%; wild grasses, 6%; dewberry, 15%; other weeds, 11%; dead vegetation, 12%.
12	3	Aug. 8	Kentucky bluegrass, 36%; timothy, 3%; lespedeza, 7%; wild grasses, 7%; dewberry, 7%; other weeds, 15%; dead vegetation, 21%; no vegetation, 4%.
13	3	Aug. 12	Kentucky bluegrass, 19%; timothy, 3%; lespedeza, 4%; wild grasses, 13%; moss, 6%; dewberry, 19%; other weeds, 18%; dead vegetation, 16%; no vegetation, 2%.
14	3	Aug. 14	Kentucky bluegrass, 24%; timothy, 3%; white clover, 7%; wild grasses, 12%; dewberry, 9%; moss, 7%; other weeds, 18%; dead vegetation, 20%.
15	3	Aug. 19	Lespedeza, 58%; wild grasses, 5%; moss, 7%; weeds, 5%; dead vegetation, 14%; no vegetation, 11%.
16	3	Aug. 19	Lespedeza, 55%; wild grass, 4%; other weeds, 15%; dead vegetation, 17%; no vegetation, 9%.
4	1	Aug. 22	Alfalfa, 26%; crabgrass, 42%; dead vegetation, 20%; no vegetation, 12%.
3	1	Aug. 24	Alfalfa, 24%; crabgrass, 39%; dead vegetation, 17%; no vegetation, 20%.
22		Aug. 26	Alfalfa, 27%; crabgrass, 49%; other weeds, 1%; dead vegetation, 12%; no vegetation, 11%.
1	4	Aug. 29	Alfalfa, 52%; grass weed, 3%; other weeds, 2%; dead vegetation, 35%; no vegetation, 8%.
20		Sept. 9	Alfalfa, 28%; lespedeza, 18%; crabgrass, 16%; foxtail, 8%; other weeds, 16%; dead vegetation, 12%; no vegetation, 2%.
6	4	Sept. 12	Alfalfa, 41%; lespedeza, 3%; wild grass, 19%; other weeds, 1%; dead vegetation, 31%; no vegetation, 5%.
18	1	Sept. 16	Alfalfa, 43%; lespedeza, 26%; wild grasses, 4%; other weeds, 4%; dead vegetation, 8%; no vegetation, 15%.
7	4	Sept. 17	Timothy, 26%; wild grasses, 8%; lespedeza, 52%; other weeds, 2%; dead vegetation, 11%; no vegetation, 1%.
24	1	Sept. 19	Wild grasses, 33%; alfalfa, 20%; sweetclover, 5%; lespedeza, 5%; weeds, 26%; dead vegetation, 3%; no vegetation, 8%.
9	4	Sept. 23	Kentucky bluegrass, 41%; redtop, 5%; timothy, 1%; wild grasses, 14%; white clover, 5%; lespedeza, 2%; dewberry, 4%; other weeds, 20%; dead vegetation, 8%.
26	1	Sept. 27	Redtop, 13%; lespedeza, 37%; wild grasses, 4%; other weeds, 12%; dead vegetation, 23%; no vegetation, 11%.
11	4	Sept. 30	Kentucky bluegrass, 38%; timothy, 2%; redtop, 1%; lespedeza, 2%; wild grasses, 16%; dewberry, 21%; other weeds, 10%; dead vegetation, 10%.

TABLE 10.--Continued

Plot	Run	Date	Type of vegetation and percentage of plot area canopied[1]
		1940	
27	1	Oct. 1	Kentucky bluegrass, 47%; redtop, 3%; timothy, 3%; wild grasses, 8%; dewberry, 12%; other weeds, 3%; dead vegetation, 23%; no vegetation, 1%.
13	4	Oct. 7	Kentucky bluegrass, 18%; wild grasses, 18%; lespedeza, 8%; dewberry, 10%; other weeds, 25%; dead vegetation, 21%.
29	1	Oct. 9	Lespedeza, 48%; weeds, 16%; dead vegetation, 18%; no vegetation, 18%.
16	4	Oct. 11	Lespedeza, 49%; wild grass, 4%; other weeds, 2%; bluegrass, 1%; redtop, 1%; dead vegetation, 21%; no vegetation, 22%.
32		Oct. 12	Bluegrass, 1%; redtop, 14%; lespedeza, 25%; weeds, 4%; dead vegetation, 53%; no vegetation, 3%.
2	4	Oct. 15	Alfalfa, 78%; wild grass, 2%; lespedeza, 1%; weeds, 1%; dead vegetation, 16%; no vegetation, 2%.
17	1	Oct. 17	Alfalfa, 19%; ragweed, 11%; crabgrass, 9%; dead vegetation, 51%; no vegetation, 10%.
4	2	Oct. 18	Alfalfa, 47%; crabgrass, 52%; no vegetation, 1%.
21		Oct. 22	Alfalfa, 14%; crabgrass, 11%; dead vegetation, 67%; no vegetation, 8%.
19		Oct. 24	Alfalfa, 33%; witch grass, 10%; dead vegetation, 57%.
5	4	Oct. 25	Alfalfa, 69%; crabgrass, 3%; weeds, 1%; dead vegetation, 19%; no vegetation, 8%.
33		Oct. 29	Alfalfa, 72%; crabgrass, 11%; weeds, 1%; dead vegetation, 16%.
8	4	Nov. 5	Redtop, 34%; timothy, 33%; bluegrass, 5%; dead vegetation, 28%.
25		Nov. 8	Bluegrass, 5%; redtop, 40%; timothy, 16%; lespedeza, 7%; weeds, 1%; dead vegetation, 31%.
12	4	Nov. 19	Kentucky bluegrass, 40%; timothy, 4%; lespedeza, 6%; broomsedge, 3%; weeds, 6%; dead vegetation, 33%; no vegetation, 8%.
23		Nov. 21	Kentucky bluegrass, timothy and redtop, 46%; dead vegetation, 54%.
10	3	Nov. 28	Kentucky bluegrass, 38%; redtop, 2%; timothy, 5%; broomsedge, 3%; lespedeza, 2%; weeds, 6%; dead vegetation, 44%.
28		Dec. 5	Kentucky bluegrass, 20%; timothy, 4%; redtop, 4%; broomsedge, 25%; weeds, 7%; dead vegetation, 40%.
14	3	Dec. 9	Kentucky bluegrass, 23%; timothy, 2%; wild grasses, 6%; dewberry, 2%; moss, 13%; weeds, 9%; dead vegetation, 42%; no vegetation, 3%.
30		Dec. 11	Kentucky bluegrass, 65%; dead vegetation, 31%; no vegetation, 4%.
15	4	Dec. 19	Kentucky bluegrass, 6%; moss, 17%; weeds, 8%; dead vegetation, 35%; no vegetation, 34%.
31		Dec. 22	Kentucky bluegrass, 4%; wild grass, 2%; lespedeza, 9%; moss, 4%; weeds, 15%; dead vegetation, 37%; no vegetation, 29%.
		1941	
31A		Jan. 8	Lespedeza, 8%; moss, 5%; weeds, 18%; wild grass, 1%; dead vegetation, 37%; no vegetation, 31%.
42		May 5	Kentucky bluegrass, 47%; grasses, 21%; weeds, 7%; white clover, 5%; dead vegetation, 20%. (B.A. = 100%)
44		May 8	Kentucky bluegrass, 76%; wild grasses, 9%; weeds, 5%; dewberry, 1%; elm sprouts, 4%; dead vegetation, 1%; no vegetation, 4%. (B.A. = 95%)
50		May 8	Crabgrass, 62%; weeds, 7%; wild grasses, 5%; lespedeza, 5%; dead vegetation, 20%; no vegetation, 1%. (B.A. = 50%)
48		May 12	Crabgrass, 38%; weeds, 24%; lespedeza, 12%; wild grasses, 2%; dead vegetation, 8%; no vegetation, 16%. (B.A. = 75%)

TABLE 10.--Continued

Plot No.	Run No.	Date	Type of vegetation and percentage of plot area canopied[1]
		1941	
46		May 13	Kentucky bluegrass, 35%; sedge, 28%; wild grasses, 12%; weeds, 12%; sprouts, 1%; dead vegetation, 12%. (B.A. = 100%)
47		May 14	Weeds, 56%; wild grasses, 26%; lespedeza, 13%; dead vegetation, 1%; no vegetation, 4%. (B.A. = 60%)
49		May 15	Crabgrass, 60%; weeds, 18%; lespedeza, 8%; dead vegetation, 11%; no vegetation, 3%. (B.A. = 85%)
51		May 16	Foxtail, 67%; lespedeza, 10%; weeds, 9%; crabgrass, 12%; dead vegetation, 2%. (B.A. = 65%)
37		May 16	Alfalfa, 34%; lespedeza, 1%; weeds, 1%; dead vegetation, 48%; no vegetation, 16%. (B.A. = 10%)
53		May 18	Kentucky bluegrass, 55%; wild grass, 7%; haw sprouts, 15%; weeds, 23%. (B.A. = 90%)
52		May 21	Kentucky bluegrass, 39%; weeds, 33%; crabgrass, 20%; lespedeza, 1%; sprouts, 1%; wild grasses, 1%; dead vegetation, 5%. (B.A. = 95%)
45		May 22	Kentucky bluegrass, 51%; weeds, 24%; wild rose, 6%; crabapple sprouts, 2%; dewberry, 2%; grasses, 9%; dead vegetation, 6%. (B.A. = 60%)
43		May 23	Sweetclover, 44%; alfalfa, 28%; weeds, 13%; alsike clover, 6%; crabgrass, 2%; rye, 3%; dead vegetation, 1%; no vegetation, 3%. (B.A. = 40%)
35		May 26	Alfalfa, 31%; ragweed, 24%; grasses, 2%; dead vegetation, 5%; no vegetation, 38%. (B.A. = 25%)
36		May 27	Alfalfa, 17%; ragweed, 21%; grasses, 24%; crabgrass, 10%; white clover, 2%; dead vegetation, 6%; no vegetation, 20%. (B.A. = 35%)
41		May 28	Alfalfa, 45%; weeds, 1%; grasses, 14%; dead vegetation, 3%; no vegetation, 37% (B.A. = 25%)
4		May 31	Alfalfa, 23%; grasses, 3%; clover, 1%; dead vegetation, 71%; no vegetation, 2%. (B.A. = 15%)
3		June 3	Alfalfa, 45%; grasses, 12%; weeds, 7%; dead vegetation, 36%. (B.A. = 20%)
40		June 5	Alfalfa, 22%; grasses, 3%; lespedeza, 21%; dead vegetation, 42%; no vegetation, 12%. (B.A. = 15%)
39		June 8	Alfalfa, 25%; dead vegetation, 55%; no vegetation, 20%. (B.A. = 5%)
1		June 9	Alfalfa, 56%; dead vegetation, 39%; no vegetation, 5%. (B.A. = 15%)
2		June 10	Alfalfa, 63%; dead vegetation, 34%; no vegetation, 3%. (B.A. = 25%)
38		June 17	Alfalfa, 58%; dead vegetation, 29%; no vegetation, 13%. (B.A. = 15%)
6		June 17	Alfalfa, 79%; dead vegetation, 18%; no vegetation, 3%. (B.A. = 25%)
5		June 19	Alfalfa, 39%; weeds, 20%; dead vegetation, 29%; no vegetation, 12%. (B.A. = 25%)
7		June 30	Lespedeza, 65%; crabgrass, 15%; weeds, 5%; redtop, 8%; no vegetation, 7%. (B.A. = 50%)
8		June 30	Redtop, 62%; lespedeza, 23%; timothy, 2%; dead vegetation, 5%; no vegetation, 8%. (B.A. = 40%)
9		June 30	Kentucky bluegrass, 56%; weeds, 30%; crabgrass, 5%; white dutch clover, 9%. (B.A. = 95%)
10		July 2	Kentucky bluegrass, 34%; wild grasses, 36%; dewberry, 5%; weeds, 22%; dead vegetation, 3%. (B.A. = 95%)
11		July 7	Kentucky bluegrass, 47%; crabgrass, 13%; dewberry, 23%; weeds, 17%. (B.A. = 100%)

TABLE 10.--Continued

Plot No.	Run No.	Date	Type of vegetation and percentage of plot area canopied[1]
		1941	
12		July 9	Kentucky bluegrass, 47%; crabgrass, 29%; weeds, 21%; white dutch clover, 2%; haw sprouts, 1%. (B.A. = 100%)
13		July 14	Wild grasses, 29%; dewberry, 25%; bluegrass, 11%; weeds, 29%; haw sprouts, 2%; dead vegetation, 4%. (B.A. = 80%)
14		July 16	Wild grasses, 47%; bluegrass, 18%; haw sprouts, 6%; dewberry, 2%; weeds, 27%. (B.A. = 75%)
15		July 21	Lespedeza, 56%; weeds, 5%; no vegetation, 39%. (B.A. = 15%)
16		July 23	Lespedeza, 48%; weeds, 14%; no vegetation, 38%. (B.A. = 15%)

[1] Percentages refer to canopy intercepted above the ground; starting May 5, 1941, basal area (B.A.) of plants is also given in percentage of plot area.

TABLE 11.--DESCRIPTION OF SOIL PROFILE CHARACTERISTICS OF INDIVIDUAL INFILTROMETER STUDY PLOTS

Plot No.	Soil name and percentage of slope	Horizon and depth in inches	Description
1	Alma silt loam, 11.72	A, 0-4	Consists of small amount of original surface soil mixed with subsoil through cultivation. Brownish-yellow heavy silt loam, slightly gray when dry; single-grain structure with slight tendency toward lamination.
		B1, 4-14	Light-brownish- to reddish-yellow silty clay loam; slight gray coatings on slightly angular aggregates; rather heavy gray mottling.
		B2, 14-32	Light-yellowish-gray silty clay loam splotched with reddish yellow. Practically structureless.
		C, 32-40	Same color and texture as B2; few small pebbles present.
2	Alma silt loam, 9.62	A, 0-7	Light-brownish-yellow friable silt loam; rather heavy grayish cast when dry; single grain structure. No A2 horizon present indicating that surface soil and subsurface soil have been completely mixed through cultivation.
		B1, 7-10	Light-brownish-yellow heavy silt loam with slight grayish coatings and some gray mottling.
		B2, 10-20	Light-brownish- to reddish-yellow silty clay loam, rather heavily mottled with light gray; slightly angular aggregates.
		C, 20-40	Mottled light-gray and reddish-yellow heavy silt to silty clay loam, occasional small pebbles present; lighter texture than B2 horizon.
3	Bogota silt loam, 0.83	A1, 0-8	Yellowish-gray friable silt loam; weak granular structure.
		A2, 8-14	Light-yellowish-gray floury silt loam; largely single-grain structure.
		B1, 14-17	Light-yellowish-gray silty clay loam; splotched with brownish yellow.
		B2, 17-36	Light-gray clay loam mottled with yellow; rather compact and plastic; slowly permeable.
		C, 36-40	Light-gray silty clay loam mottled with yellow; little structural development.
4	Bogota silt loam, 1.30	A1, 0-7	Grayish-yellow friable silt loam; weak granular structure.
		A2, 7-14	Light-yellowish-gray floury silt loam; largely single-grain structure.
		B1, 14-17	Light-yellowish-gray silty clay loam; splotched with brownish yellow.
		B2, 17-36	Light-gray heavy clay loam mottled with yellow; compact and plastic; slowly permeable.
		C, 36-40	Light-gray silty clay loam mottled with yellow; little structural development.
5	Bogota silt loam, 1.22	A1, 0-8	Medium-dark-yellowish-gray friable silt loam; weak granular structure; loose friable consistency.
		A2, 8-15	Light-yellowish-gray floury silt loam; largely single-grain structure.
		B1, 15-18	Light yellowish gray heavy silt loam; granular structure, brownish yellow gray inside granules coated with light yellow gray.

TABLE 11.--Continued

Plot No.	Soil name and percentage of slope	Horizon and depth in inches	Description
5 contd.	Bogota silt loam	B2, 18-30	Light-gray clay loam with splotches of reddish yellow; rather compact and plastic; slow permeability.
		C, 30-40	Light-gray silty clay loam mottled with reddish yellow; little structural development; lighter texture than B2.
6	Bogota silt loam, 1.00	A1, 0-7	Yellowish-gray floury silt loam; weak granular structure.
		A2, 7-14	Ashy-gray floury silt loam with a slight yellowish cast; largely single-grain structure.
		B1, 14-16	Light-yellowish-gray heavy silt loam; granules yellowish gray coated with ashy gray.
		B2, 16-28	Light-gray clay loam slightly mottled with reddish yellow; mottling becomes somewhat heavier with depth; rather compact and plastic; slowly permeable.
		C, 28-40	Light-gray silty clay loam rather heavily mottled with reddish yellow; little structural development.
7	Bogota silt loam, 1.36	A1, 0-7	Yellowish-gray floury silt loam; weak granular structure.
		A2, 7-12	Light-yellowish-gray friable silt loam; largely single-grain structure.
		A3, 12-18	Ashy-gray friable silt loam; largely single-grain structure.
		B1, 18-20	Light-brownish-yellow heavy silt loam; granules very heavily coated with light gray; considerable gray mottling.
		B2, 20-34	Light-gray heavy clay loam mottled with reddish yellow; rather compact and plastic; slowly permeable.
		C, 34-40	Light-gray silty clay loam mottled with reddish yellow; somewhat lighter in texture than B2.
8	Bogota silt loam, 1.30	A1, 0-7	Medium-dark-yellowish-gray friable silt loam; weak granular structure.
		A2, 7-12	Light-yellowish-gray floury silt loam; largely single-grain structure.
		A3, 12-17	Ashy-gray floury silt loam; single grain structure.
		B1, 17-19	Light-brownish-yellow heavy silt loam; granules heavily coated with gray.
		B2, 19-34	Mottled light-gray and bright-brownish-yellow heavy clay loam; rather compact and plastic; slowly permeable.
		C, 34-40	Light-gray silty clay loam mottled with reddish yellow; practically structureless; lighter in texture than B2.
9	Alma silt loam, 8.27	A1, 0-6	Dark-grayish-yellow floury silt loam; granular structure.
		A2, 6-12	Light-grayish-yellow friable silt loam; slight vesicular structure.
		B1, 12-15	Light-brownish-yellow heavy silt loam; granules lightly coated with light gray.
		B2, 15-28	Light-brownish-yellow silty clay loam; slightly angular aggregates coated with light gray; a few light gray splotches present.
		C, 28-40	Light-gray heavy silt to silty clay loam with reddish-yellow splotches; practically structureless.

TABLE 11.--Continued

Plot No.	Soil name and percentage of slope	Horizon and depth in inches	Description
10A	Alma silt loam, 8.50	A1, 0-8	Dark-yellowish-gray friable silt loam; weak granular structure.
		A2, 8-13	Light-yellowish-gray floury silt loam; single-grain structure.
		B1, 13-16	Mottled brownish-yellow and light-gray heavy silt loam.
		B2, 16-28	Light-brownish-yellow heavy silty clay loam; heavily coated and mottled with light gray; slightly angular structure; medium compact and medium plastic; fairly permeable.
		C, 28-36	Light-gray silty clay loam mottled with reddish yellow; practically structureless; lighter in texture than B2.
		C2, 36-40	Light-gray heavy silt loam, slightly mottled with reddish yellow; structureless.
10	Alma silt loam, 8.30		Practically identical with plot 9.
11	Bogota silt loam, 1.25	A1, 0-7	Brownish-yellow-gray floury silt loam; weakly granular.
		A2, 7-16	Light-yellow-gray friable silt loam; largely single grain.
		B1, 16-22	Light-yellowish-gray silty clay loam splotched with brownish yellow; granular structure.
		B2, 22-32	Heavy clay loam consisting of mixture of brownish-yellow and light-gray mottlings; medium compact and medium plastic; fairly permeable.
		C, 32-40	Light-gray silty clay loam heavily mottled with brownish yellow; practically structureless; somewhat lighter in texture than B2.
12	Bogota silt loam, 1.67	A1, 0-7	Dark-yellowish-gray floury silt loam; weak granular structure.
		A2, 7-16	Gray friable silt loam with a few dark-yellow stains; largely single-grain structure.
		A3, 16-20	Light-yellowish-gray friable silt loam; single-grain structure.
		B1, 20-23	Mottled yellow and light-gray heavy silt loam; granular.
		B2, 23-40	Mixed light-gray and bright-yellow clay loam, medium compact; medium plastic; fairly permeable.
13	Elco silt loam, 15.25	A1, 0-6	Grayish-yellow friable silt loam; weak granular structure.
		A2, 6-10	Light-grayish-yellow floury silt loam; largely single grain.
		B1, 10-18	Light-brownish yellow-gray silty clay loam; granular aggregates; slightly plastic; permeable.
		C, 18-24	Light-brownish yellow-gray silty clay loam; occasional small fragments of rock.
		C2, 24-40	Yellowish-gray silty clay loam with brownish-yellow stains; small rock fragments, becoming somewhat larger below 30 inches; structureless; little sand present.

TABLE 11.--Continued

Plot No.	Soil name and percentage of slope	Horizon and depth in inches	Description
14	Elco silt loam, 16.83	A1, 0-3	Dark-grayish-yellow friable silt loam; weak granular structure.
		A2, 3-8	Yellow friable silt loam with slight grayish cast; largely single grain.
		B1, 8-11	Light-brownish-yellow heavy silt loam, with some gray mottlings; granular aggregates are very lightly coated with gray.
		B2, 11-20	Light-brownish-yellow heavy silt to silty clay loam; subangular aggregates lightly coated with gray; some gray mottling occurs; slightly plastic; permeable.
		C, 20-40	Light-yellowish-gray heavy silt loam, with brownish-yellow mottling and numerous dark iron stains; occasional tiny rock fragments occur.
15	Elco silt loam, 12.11 (eroded)	A, 0-2	Light-brownish-yellow silt loam; tends toward lamination; small amount of clay present; mixture of surface and subsoil.
		B1, 2-20	Light-brownish-yellow silty clay loam, lightly coated and heavily splotched with gray; subangular aggregates.
		C, 20-40	Yellowish-gray heavy silt loam, mottled with brownish yellow; friable silt loam below 30 inches; structureless.
16	Elco silt loam, 11.11 (eroded)	A, 0-3	Grayish-yellow friable silt loam; slightly laminated; small amount of clay present; mixture of surface and subsoil.
		B1, 3-15	Light-brownish-yellow silty clay loam heavily mottled with light gray; subangular aggregates are coated with light gray; slightly plastic; permeable.
		B2, 15-26	Light-yellowish-gray heavy silt to silty clay loam; heavily mottled with reddish yellow.
		C, 26-40	Mottled gray and light-brownish-yellow silt loam; friable; small amount of clay present; structureless.
17	Bogota silt loam, 1.20	A1, 0-9	Medium-dark-yellowish-gray silt loam, weak granular structure.
		A2, 9-15	Ashy gray floury silt loam; largely single-grain structure.
		B1, 15-18	Light-gray silty clay loam slightly mottled with grayish yellow.
		B2, 18-38	Light-gray heavy clay loam mottled with yellow; compact; plastic; slowly permeable.
		C, 38+	Light-gray silty clay loam mottled with yellow.
18	Bogota silt loam, 0.58	A1, 0-8	Medium-dark-yellowish-gray silt loam; weak granular structure.
		A2, 8-14	Light-yellowish-gray floury silt loam; largely single-grain structure.
		B1, 14-17	Light-yellowish-gray silty clay loam; mottled with yellow.
		B2, 17-36	Light-gray clay loam mottled with brownish yellow; medium compact; plastic; slowly permeable.
		C, 36-40	Light-gray silty clay loam mottled with yellow.

TABLE 11.--Continued

Plot No.	Soil name and percentage of slope	Horizon and depth in inches	Description
19	Bogota silt loam, 0.47	A1, 0-5	Yellowish-gray silt loam; largely single-grain structure.
		A2, 5-12	Yellowish-gray floury silt loam; single-grain structure.
		B1, 12-15	Light-yellowish-gray silty clay loam; mottled with yellow.
		B2, 15-34	Light-gray clay loam mottled with brownish yellow; medium compact; plastic; slowly permeable.
		C, 34-40	Light-gray silty clay loam mottled with yellow.
20	Alma silt loam, 7.60	A1 and A2, 0-7	Light-brownish-yellow silt loam with slight grayish cast; mixture of surface and subsurface horizons.
		B1, 7-10	Light-yellowish heavy silt loam; slight grayish coatings and some gray mottling.
		B2, 10-32	Light-brownish-yellow silty clay loam, rather heavily mottled with light gray; slightly angular aggregates; more mottled and deeper than average B2 horizon in Alma profile.
		C, 32-40	Mottled light-gray and reddish-yellow silty clay loam; somewhat more friable than B2 horizon.
21	Bogota silt loam, 2.70	A1 and A2, 0-6	Yellowish-gray silt loam; largely single-grain structure; mixture of surface and subsurface horizons.
		B1, 6-9	Light-yellowish-gray silty clay loam.
		B2, 9-24	Light-gray heavy silty clay to clay loam, rather heavily mottled with brownish yellow; somewhat lighter in texture and more yellow than average Bogota profile.
		C, 24-40	Mottled light-gray and yellow silty clay loam.
22	Bogota silt loam, 0.83	A1, 0-8	Medium-dark-yellowish-gray silt loam; weak granular structure.
		A2, 8-15	Ashy-gray floury silt loam; largely single-grain structure.
		B1, 15-18	Light-gray silty clay loam; slightly mottled with grayish yellow.
		B2, 18-38	Light-gray clay loam, mottled with brownish yellow; medium compact; plastic; slowly permeable.
		C, 38-40	Light-gray silty clay loam mottled with yellow.
23	Bogota silt loam, 4.60	A1, 0-5	Yellowish-gray silt loam; weak granular structure.
		A2, 5-11	Light-gray floury silt loam; largely single-grain structure.
		B1, 11-15	Light-gray silty clay loam mottled with grayish yellow.
		B2, 15-30	Mottled light-gray and yellow heavy silty clay to clay loam; somewhat lighter in texture and more yellow than the average Bogota profile.
		C1, 30-38	Mottled light-gray and yellow light silty clay loam.
		C2, 38-40	Light-gray silt loam mottled with yellow.
24	Alma-Bogota silt loam, 2.70	A, 0-8	Medium-dark-yellowish-gray silt loam; largely single-grain structure; no A2 distinguishable; appears that surface soil had been removed by erosion and the horizon subsequently silted in.
		B1, 8-12	Yellowish heavy silt to light silty clay loam with some gray mottling.

TABLE 11.--Continued

Plot No.	Soil name and percentage of slope	Horizon and depth in inches	Description
24 contd.	Alma-Bogota silt loam	B2, 12-26	Yellowish heavy silty clay to clay loam, mottled with gray.
		C1, 26-34	Mottled light-gray and yellow heavy silt to light silty clay loam; more gray than B2, but lighter in texture.
		C2, 34-40	Light-gray silt loam mottled with yellow.
25	Bogota silt loam, 0.25	A1, 0-7	Medium-dark-yellowish-gray silt loam; weak granular structure.
		A2, 7-14	Light-gray floury silt loam; single-grain structure.
		B1, 14-18	Light-yellowish-gray heavy silt to silty clay loam, splotched with brownish yellow.
		B2, 18-32	Light-gray clay loam; heavily mottled with brownish yellow; somewhat lighter in texture than average Bogota profile.
		C, 32-40	Light-gray silty clay loam mottled with yellow.
26	Alma silt loam, 8.40	B1, 0-3	Light-brownish-yellow heavy silt to light silty clay loam, slightly darker than B2; probably small amount of surface soil mixed with this layer.
		B2, 3-18	Mottled yellow and light gray silty clay loam.
		C1, 18-30	Light-gray heavy silt to light silty clay loam with some yellow mottling.
		C2, 30+	Light-gray silt loam mottled with yellow.
27	Bogota silt loam, 2.70	A1, 0-7	Medium-dark-yellowish-gray silt loam; weak granular structure.
		A2, 7-14	Ashy-gray floury silt loam; largely single grain structure.
		B1, 14-17	Light-yellowish-gray silty clay loam, mottled with yellow
		B2, 17-37	Light-gray clay loam mottled with brownish yellow.
		C, 37-40	Light-gray silty clay loam mottled with yellow.
28	Alma-Elco silt loam, 12.00	A2, 0-7	Grayish-yellow silt loam, slightly darker than normal A2, especially the surface inch.
		B1, 7-10	Yellowish light silty clay loam with grayish cast.
		B2, 10-24	Yellowish silty clay loam very slightly mottled with light gray.
		C, 24-40	Mottled yellow and light gray heavy silt to light silty clay loam.
29	Elco silt loam, 5.50	B1, 0-1 1/2	Dark-grayish-yellow light silty clay loam.
		B2, 1 1/2-16	Yellowish silty clay loam.
		C, 16+	Mottled gray and yellow silty clay loam; occasional small pebbles.
30	Elco silt loam, 8.70	A, 0-7	Medium-dark-grayish-yellow silt loam; surface inch slightly darker than underlying 6 inches.
		B1, 7-10	Grayish-yellow heavy silt loam.
		B2, 10-24	Mottled yellow and light-gray silty clay loam; more gray than normal for profile but not unusually heavy.
		C. 24-40	Light-gray heavy silt loam with slight yellow mottling.
31	Elco silt loam, 12.40	A2, 0-3	Grayish-yellow silt loam; largely single-grain structure.
		B1, 3-7	Yellowish heavy silt loam, slightly mottled with light gray.

TABLE 11.--Continued

Plot No.	Soil name and percentage of slope	Horizon and depth in inches	Description
31 contd.	Elco silt loam	B2, 7-22	Yellow silty clay loam slightly mottled with gray.
		C1, 22-34	Slightly more gray and slightly lighter in texture than B2.
		C2, 34-40	Light-gray heavy silt loam, mottled with some yellow.
31A	Elco silt loam, 10.04		Practically identical with plot 31.
32	Alma silt loam, 7.80	A, 0-3	Light-brownish-yellow silt loam with a slight grayish cast; largely single-grain structure; mixture of surface and subsurface soil.
		B1, 2-6	Light-brownish-yellow heavy silt to light silty clay loam casted with light gray.
		B2, 6-18	Mottled yellow and light-gray silty clay loam; slightly heavier and more grayish than average Alma profile.
		C2, 34+	Becomes gritty but does not change appreciably in texture or color.
33	Bogota silt loam, 0.0	A1, 0-6	Yellowish-gray silt loam; weak granular structure.
		A2, 6-13	Ashy-gray floury silt loam; largely single-grain structure.
		B1, 13-15	Light-yellowish-gray silty clay loam.
		B2, 15-36	Light-gray clay loam mottled with brownish yellow; medium compact and plastic; slowly permeable.
		C, 36-40	Light-gray silty clay loam mottled with yellow.
34	Elco silt loam, 12.20		Practically identical with plot 13.
35	Bogota silt loam, 2.90	A, 0-9	Medium-dark-yellowish-gray silt loam; granular structure.
		A2, 9-11	Light-yellowish-gray floury silt loam; largely single-grain structure.
		B1, 11-17	Light-gray silty clay loam slightly mottled with balls of heavier yellow.
		B2, 17-32	Gray to yellow mottled heavy clay loam; compact and plastic.
		C, 32-40	Light-gray silty clay loam mottled with yellow.
36	Bogota silt loam, 1.30	A1, 0-7	Medium-dark-yellowish-gray silt loam; granular structure.
		A2, 7-11	Light-gray to yellow floury silt loam; single-grain structure.
		A3, 11-18	Ashy-gray floury silt loam; single-grain structure.
		B1, 18-30	Light-yellowish-gray silty clay loam mottled with yellow.
		B2, 30-43	Light-gray to yellow clay loam mottled with heavy yellow; plastic and compact.
		C, 43+	Light-gray silty clay loam mottled with yellow.
37	Bogota silt loam, 1.00	A1 and A2, 0-9	Medium-dark-yellowish-gray silt loam; little more floury than usual A1.
		A3, 9-19	Ashy-gray floury silt loam; single-grain structure.
		B1, 19-28	Light-yellowish-gray silty clay loam.
		B2, 28-43	Yellowish-gray clay loam mottled with heavier yellow; compact and plastic.
		C, 43	Light-gray silty gray clay loam mottled with yellow.

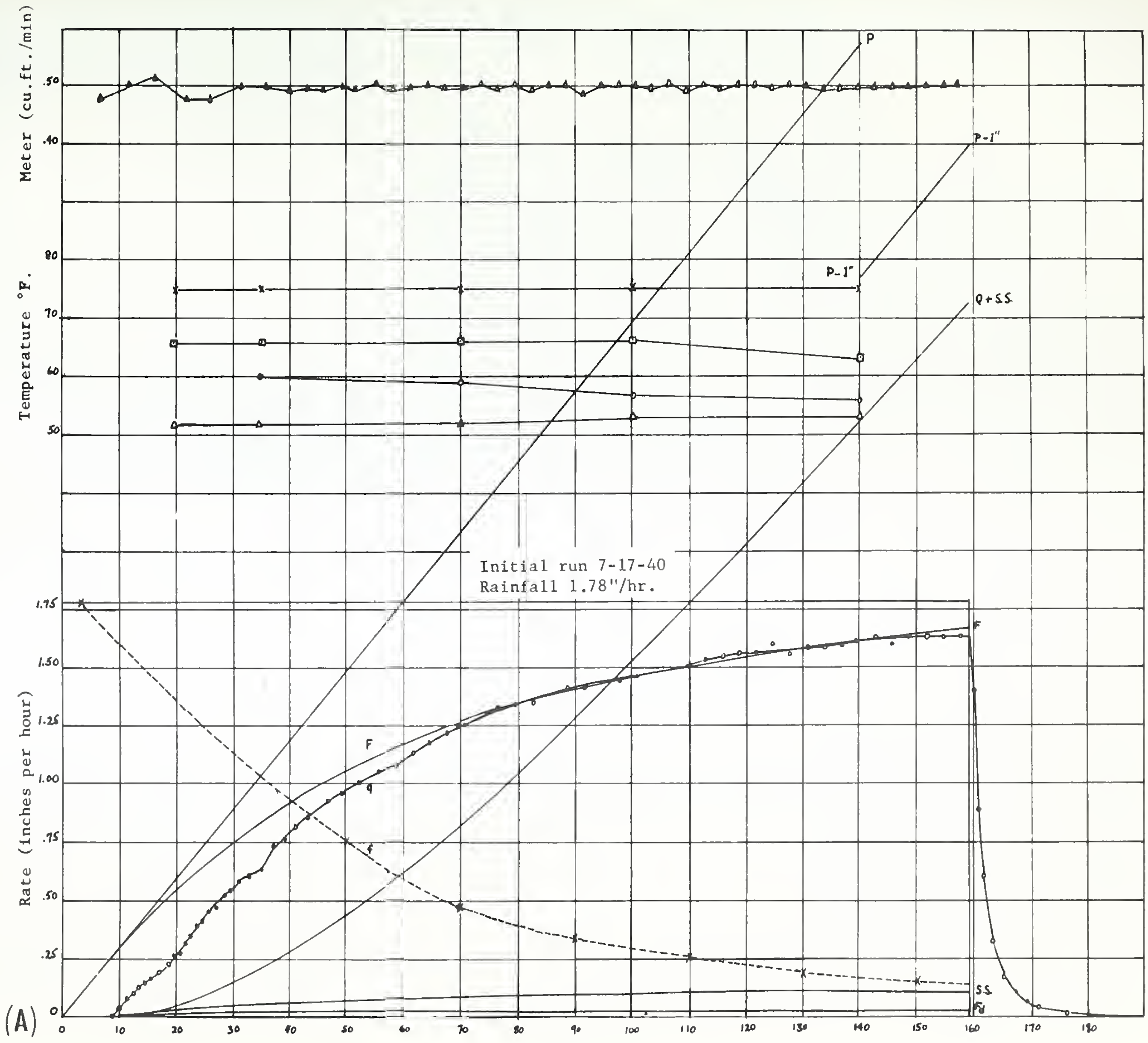
TABLE 11.--Continued

Plot No.	Soil name and percentage of slope	Horizon and depth in inches	Description
38	Bogota silt loam, 1.90	A1, 0-7	Medium-dark-yellowish-gray silt loam; weak granular structure.
		A2, 7-15	Light-yellowish-gray floury silt loam; single-grain structure.
		B1, 15-20	Light-yellowish-gray silty clay loam mottled with yellow.
		B2, 20-32	Light-yellowish-gray clay loam mottled with heavier yellow; plastic and compact.
		C, 32-40	Light silty clay loam mottled with yellow.
39	Bogota silt loam, 0.80	A1, 0-8	Usual A1.
		A2, 8-10	Lighter in color and texture than A1.
		B1, 10-16	Light-yellow to gray silty clay loam mottled slightly.
		B2, 16-33	Light-gray to yellow clay loam mottled with heavier yellow; plastic and compact.
		C, 33-40	Light-gray silty clay loam mottled with yellow.
40	Bogota silt loam, 5.20	A1, 0-9	Usual A1
		A2, 9-12	Ashy-gray to yellow silt loam.
		B1, 12-21	Light-yellow to gray silty clay loam mottled with yellow.
		B2, 21-30	Yellow to gray clay loam mottled with heavier yellow; plastic and compact.
		C, 30-40	Light-gray silty clay loam mottled with yellow.
41	Bogota silt loam. 0.20	A1. 0-7	Grayish-yellow friable silt loam; weak granular structure.
		A2, 7-14	Light-yellowish-gray floury silt loam; single-grain structure.
		A3. 14-17	Ashy-gray floury silt loam; single-grain structure.
		B1, 17-21	Light-yellowish-gray silty clay loam.
		B2, 21-34	Yellowish-gray clay loam mottled with heavier yellow; plastic and compact.
		C, 34-40	Grayish-yellow mottled silty clay loam.
42	Bogota silt loam, 1.05	A1, 0-8	Medium-dark-yellowish-gray silt loam; granular structure.
		A2, 8-11	Gray friable silt loam; single-grain structure.
		A3, 11-16	Light-ashy-gray floury silt loam.
		B1, 16-20	Mottled yellow and light-gray silt loam; granular structure.
		B2, 20-36	Mixed gray to yellow clay loam; compact and plastic.
		C, 36+	Light-gray silty clay loam mottled with heavier yellow.
43	Bogota silt loam, 0.20	A1, 0-8	Dark-gray floury silt loam; granular structure.
		A2, 8-10	Transition layer from A1 to A3.
		A3, 10-18	Ashy-gray floury silt loam.
		B1, 18-27	Pale-yellow silty clay loam. An extremely light soil down to 24 inches and slightly heavier from 24 to 27 inches, but not heavy enough for B2.
		C, 27+	Light-gray silty clay loam mottled with yellow; lighter textured soil than B1.
44	Bogota silt loam, 0.50	A1, 0-9	Dark-gray floury silt loam; weak granular structure.
		A2, 9-15	Medium-gray friable silt loam; single-grain structure.
		B1, 15-25	Mottled yellow and light-gray silty clay loam.

TABLE 11.--Continued

Plot No.	Soil name and precentage of slope	Horizon and depth in inches	Description
44 contd.	Bogota silt loam	B2, 25-37	Mottled gray and yellow clay loam; medium plastic and compact.
		C, 37+	Light-gray mottled silty clay loam.
45	Glaciated "C" horizon or Hickory gravelly silt loam, 18.00	C1, 0-8	Medium-dark-gray sandy silt loam; few small pebbles and considerable organic matter; very open.
		C2, 8+	Yellowish-gray sandy clay loam containing small pebbles of rock; no mottling until approximately 20 inches. This plot is located near the foot of a very steep slope and has lost all of the A and B horizons through erosion.
46	Alma silt loam, 10.70	A1 and A2, 0-5	Light-gray to yellow silt loam; high in organic matter; very pervious.
		B1, 5-20	Mottled yellow and gray heavy silt loam; granular.
		B2, 20-32	Mottled yellow and gray clay loam; medium compact; plastic.
		C, 32+	Mottled light-gray and yellow silty clay loam.
47	Alma-Bogota silt loam	A, 0-7	Mixed light-gray and yellow silt loam; single grain; floury.
		B1, 7-16	Mottled yellow and light-gray heavy silt loam; granular.
		B2, 16-34	Mottled pale-yellow and yellow clay loam; plastic; compact.
		C, 34	Mottled light-gray and yellow silty clay loam.
48	Bogota silt loam, 3.70	A1, 0-9	Brownish-yellow-gray floury silt loam; weakly granular.
		A2, 9-15	Light-yellow to gray friable silt loam; single grain.
		B1, 15-21	Light-yellowish-gray silty clay loam mottled with brownish yellow.
		B2, 21-35	Light-yellow clay loam mottled with brownish yellow; plastic.
		C, 35+	Light-gray silty clay loam mottled with yellow.
49	Bogota silt loam, 0.80	A, 0-7	Medium-dark-yellowish-gray friable silt loam; weakly granular.
		A2, 7-11	Light-gray to yellow floury silt loam; single grain.
		A3, 11-14	Ashy-gray floury silt loam; single grain.
		B1, 14-20	Pale-brownish-yellow to gray silty clay loam or heavy silt loam.
		B2, 20-36	Mottled light-gray and bright-brownish-yellow heavy clay loam; compact.
		C, 36+	Light-gray silty clay loam mottled with reddish yellow.
50	Bogota silt loam, 0.95	A1, 0-10	Medium-dark-yellowish-gray friable silt loam; granular.
		A2, 10-14	Light-gray to yellow friable silt loam; granular.
		A3, 14-17	Ashy-gray floury silt loam.
		B1, 17-23	Pale-yellow silty clay loam, slightly mottled.
		B2, 23-33	Yellow clay loam; heavily mottled; plastic.
		C, 33+	Light-gray silty clay loam mottled with yellow.
51	Bogota silt loam, 2.70	A1, 0-6	Yellowish-gray floury silt loam; weakly granular structure.
		A2, 6-9	Light-yellowish-gray friable silt loam; single grain.
		A3, 9-12	Ashy-gray floury silt loam.
		B1, 12-16	Pale-yellow slightly mottled silty clay loam.

Plot No.	Soil name and percentage of slope	Horizon and depth in inches	Description
51 contd.	Bogota silt loam	B2, 16-31	Yellowish-gray clay loam; mottled with brownish yellow; plastic.
		C, 31+	Light-gray silty clay loam mottled with brownish yellow.
52	Alma silt loam, 3.00	A1, 0-9	Dark-grayish-yellow floury silt loam; granular.
		A2, 9-12	Light-grayish-yellow friable silt loam; granular.
		B1, 12-24	Pale-yellow to gray heavy silt loam.
		B2, 24-38	Yellow to gray clay loam, splotched with darker yellow; plastic.
		C, 38+	Light-gray and yellow silty clay, mottled.
53	Bogota silt loam, 1.60	A1, 0-9	Brownish-yellow to gray floury silt loam; granular.
		A2, 9-14	Light-yellowish-gray friable silt loam; granular.
		B1, 14-24	Pale-yellow silty clay loam; slightly mottled.
		B2, 24-36	Yellow and reddish-yellow mottled clay loam; plastic.
		C, 36+	Light gray and yellow mottled silty clay loam.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70
60
50
Rate (inches per hour)
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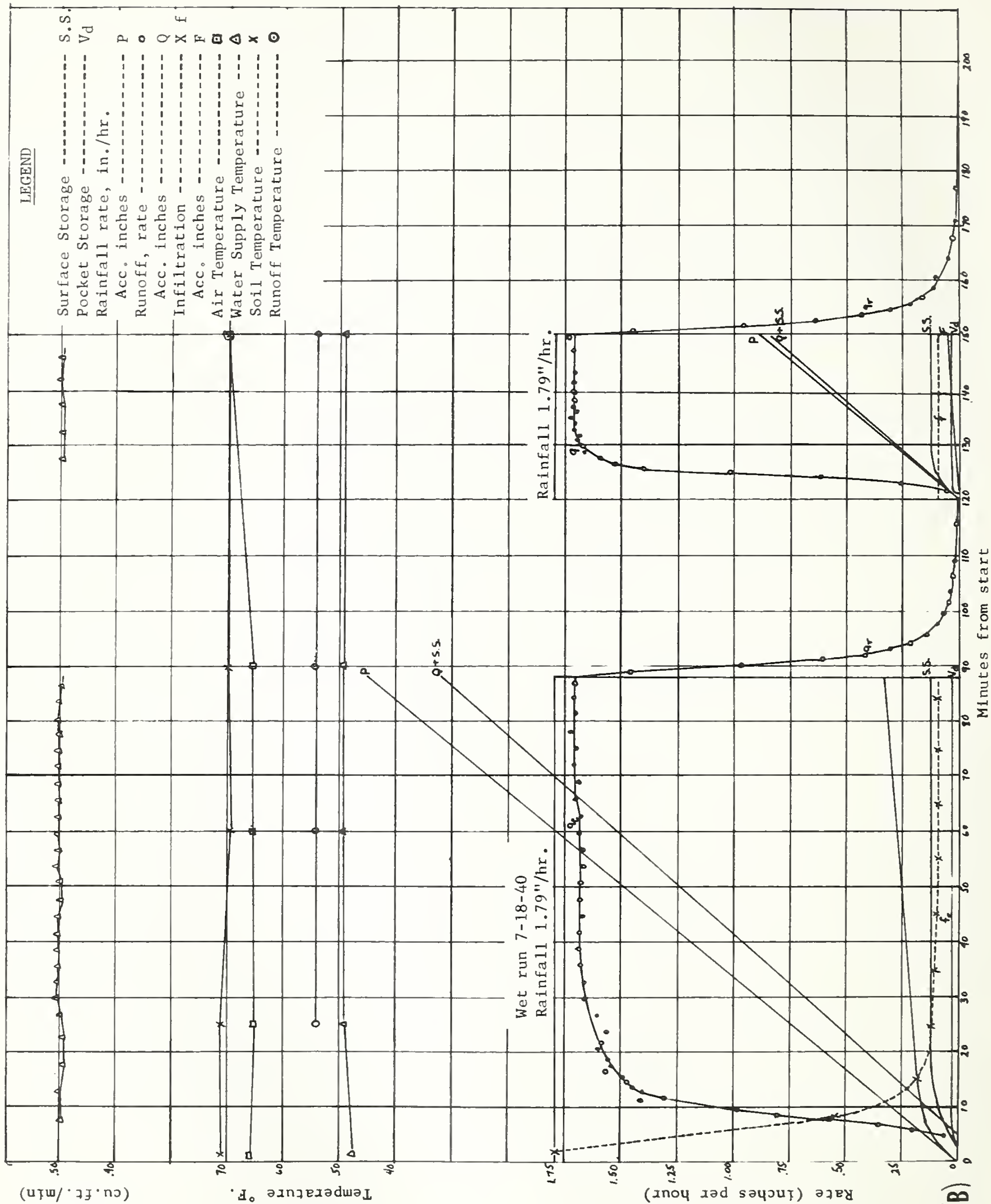
1.25
1.00
.75
.50
.25
0
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
P
P-1"
P-1"
Q+S.S.
Initial run 7-17-40
Rainfall 1.78"/hr.
F
F
q
f
S.S.
Fd
(A)



(B)

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